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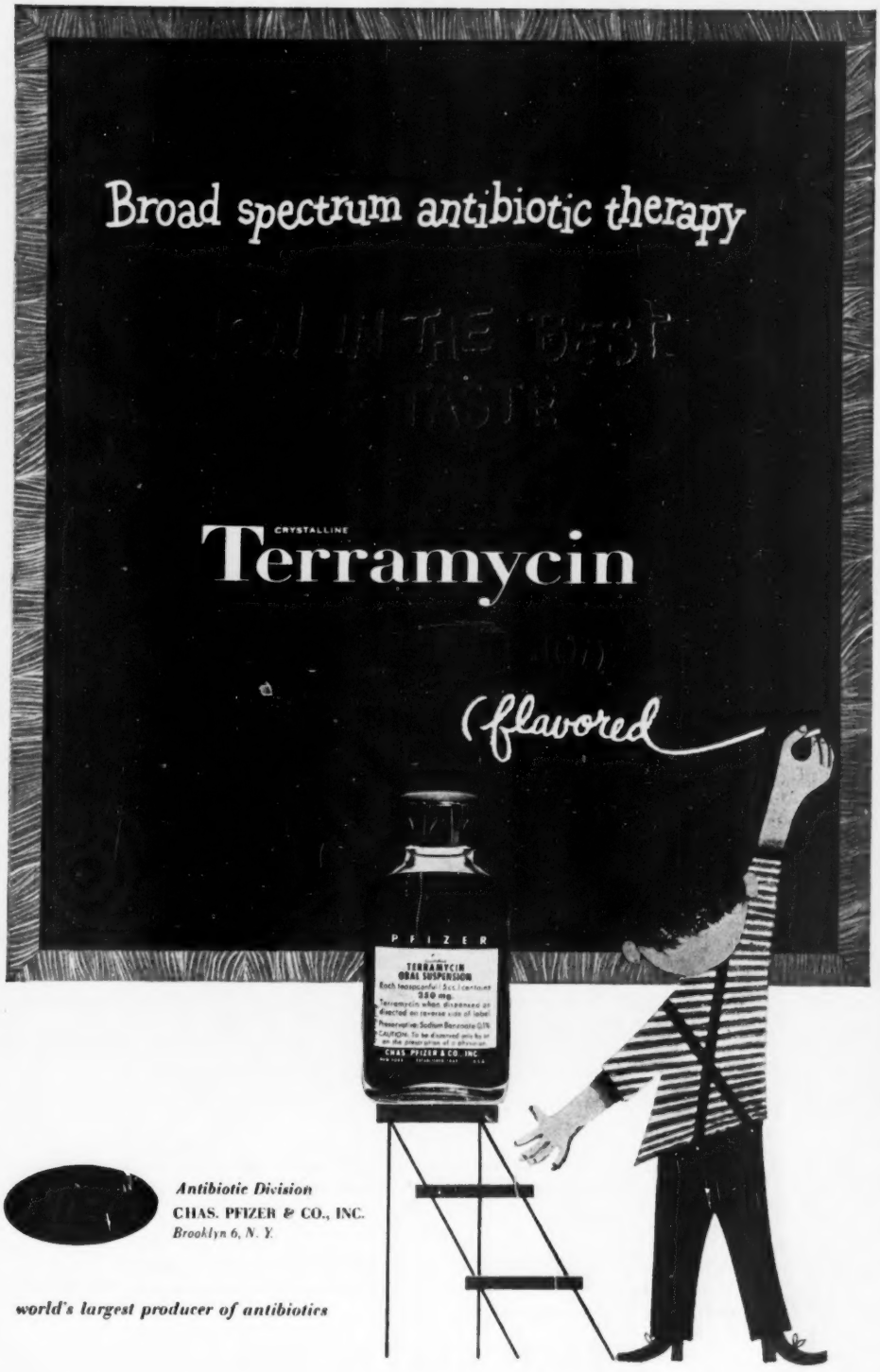

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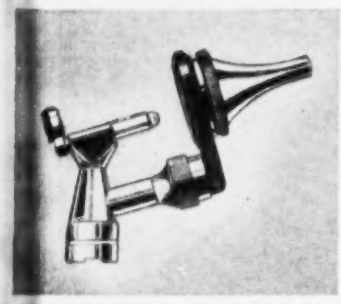

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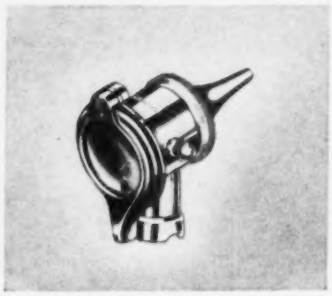

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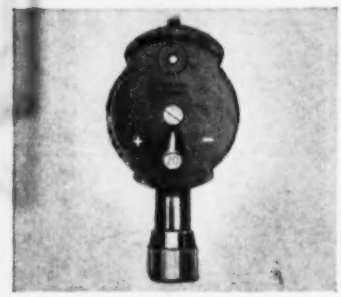

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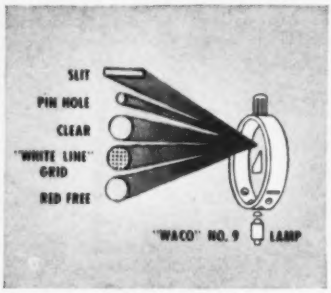

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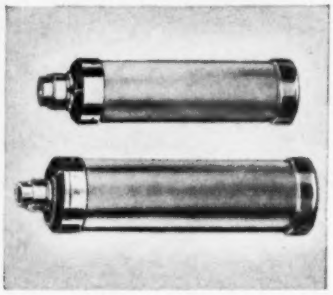

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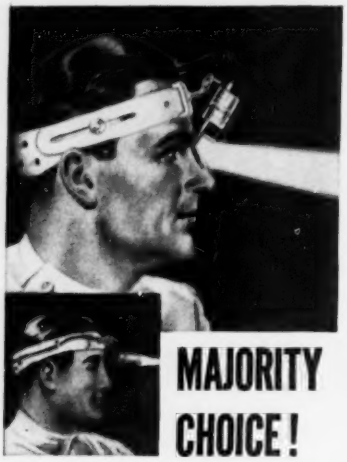

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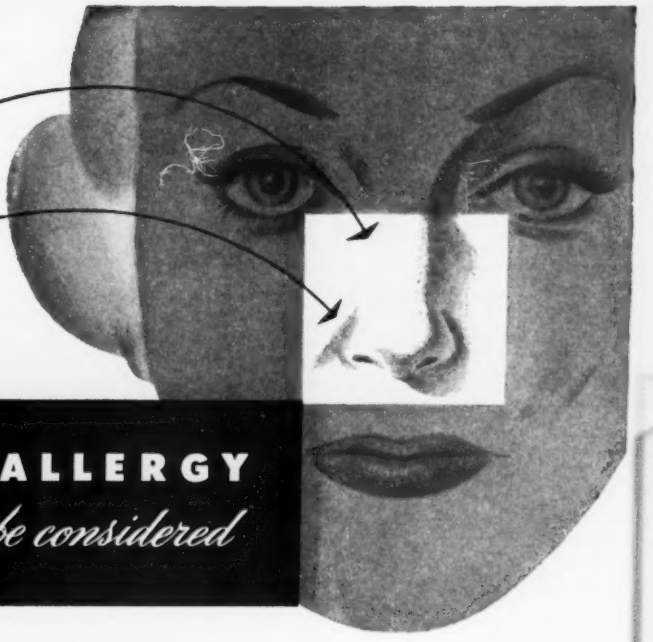

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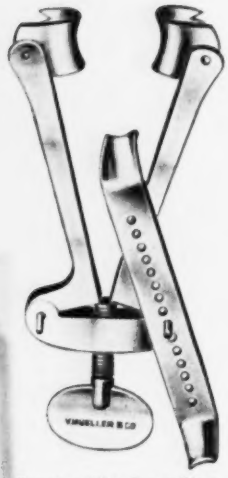

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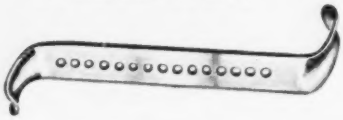

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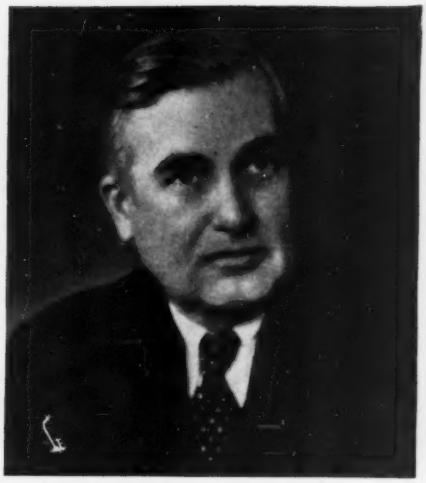

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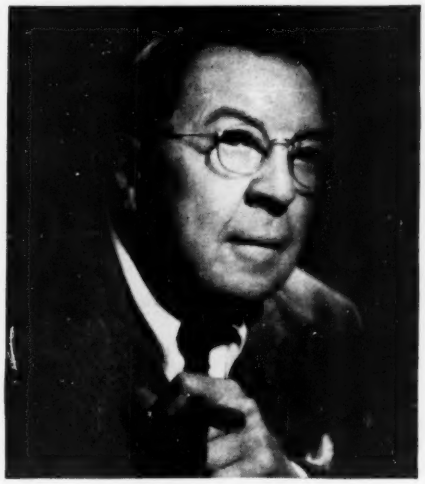

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ARCHIVES OF OTOLARYNGOLOGY

VOLUME 56 SEPTEMBER 1952 NUMBER 3

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LITERARY ASPECTS OF MEDICAL JOURNALISM

Address Delivered at the State Medical Journalism Conference, American Medical Association Headquarters, Chicago, Nov. 12, 1951

HARRY L. SHAW
NEW YORK

I SHOULD like to begin by overcoming those difficulties and problems that confronted me when I was here four years ago and most of which still confront me now.

I have pointed out that it is rather difficult to discuss the literary aspects of medical journalism when one is a lay person whose literary aspects are virtually nonexistent. I also tried to point out that at that time I had done my homework. I had read a few issues of three different state journals, and I had some opinions. However, having worked in the field as long as I have, I know that one cannot dissociate style and subject matter. When one discusses literary aspects, one should have some understanding of what the subject matter is. Style, after all, has been defined in many ways, but I frequently have defined it as the imprint of personality on subject matter, and I have known a good many doctors in my time and have never found one without a vivid personality. So, I could detect literary aspects in medical journalism if I knew something about the subject matter, but not knowing that, that was a difficulty that confronted me.

I also pointed out that I was laboring under difficulties in talking to an unusually homogeneous audience. I understand that at least half of the persons in the room have had a very similar period of medical training, and I might point out to you that all of my adult life I have been writing or attempting to edit for general magazines or for the general book-reading public. With the exception of a few other learned groups in law or dentistry or what not, you have probably the most homogeneous group that I have talked to.

I assume that you would take my statement for it that as I looked over medical journals, I decided that they were just about half way between a trade journal and a general publication. A trade journal—and I in my youth attempted to edit a couple of those—is obviously designed to make money for subscribers. I take it that medical journals have the ambition to help subscribers make money only incidentally.

Another difficulty, however, has been added. I spoke, as your chairman mentioned, to a somewhat similarly constituted group here in Chicago four years ago. I was horrified to discover half way through the talk that an attractive young lady was taking down all of my grammatical blunders and incorrect syntax. I was even more disturbed when I later saw the gist of my remarks printed.

General Editor Harper & Brothers.

I recognize that there are some persons in this audience who heard me then, but I am well aware of the fact that if you did, you have long since forgotten what I said.

I have still another difficulty this time. I haven't read a medical journal of any kind in the last four years, so that I really don't know whether the general comments that I am going to make about literary aspects of journalism apply now as they certainly did in my opinion four years ago.

Let me say that I am beginning by making two assumptions: I assume that largely, with a few exceptions, medical journals are read by physicians. That is a pretty basic assumption in terms of what I am going to say, and it will explain why, in some instances, my remarks may be misguided, because, as I say, I don't have any of that professional background.

My second assumption is that doctors are human like everyone else. Certainly all of the doctors that I have known were and are human, and I assume that you have many of the difficulties and problems that beset any modern man or woman.

I have talked to many doctors in the last four years, and I have heard that increasing complaint that, I am sure, everyone in this room has uttered, "I simply don't have time to keep up not only with the literature in my field, but medical literature in general or the literature as it pours off the presses in this country."

I came across a few statistics recently that I think may amuse you. They appeared in a reputable magazine, and I have no reason to doubt their accuracy. According to this report, each year for the information, entertainment, and guidance of Americans, our press prints and sells in minimum two quadrillion, six hundred seventy-nine trillion, five hundred twenty-two billion, two hundred million words. Radio, a not very close runner-up, pours out one trillion words, or, in the case of singing commercials, word substitutes.

Hollywood dream factories produce together a combination of at least thirty billion words and about one trillion, five hundred billion consecutive pictorial images.

The magazine world puts out some one hundred sixty-five trillion words a year.

All this comes up to the tidy sum of about three quadrillion words annually, an average of seven hundred thousand words per minute per adult.

Thus, if you were able, in one minute, to read one issue each of the *New York Times*, the *New York Herald Tribune*, plus a good-sized novel, and at the same time, listen to a hundred radio programs, view fifty double-feature movies, you would nearly consume the total wordage of that quantity available, within one minute. Of course, these totals are approximate, and they do not include books, television, FM, facsimile reproductions, microwave transmissions, or the *Congressional Record*.

How, then, can you keep up with the literature in your own field or in a general field?

May I make one comment which, perhaps, I have no right to make, but I have a further assumption. This is that more of you might conceivably spend more time with your medical journals if, possibly, they had a somewhat greater degree of literary quality and mechanical make-up. I am not going to discuss the second point, but I think, perhaps, I can make a few general observations that might apply to medical journals as they do to literature in general.

I have a theme that has to do with communication, incubation, and rewriting, and, with your permission, I am going to develop those topics for a few moments.

First of all, I think that too frequently persons who write, whether they write for medical journals, whether they read, or whether they edit medical journals, forget that writing that does not communicate is not writing. I belong to the school that believes that a book is not necessarily a book until it is read and that a medical journal is not a medical journal until it is in the hands of a reader. But it seems to me that writers frequently play up the "I" of the writer and not the "you" of the reader, and that very little communication comes through.

I have a few suggestions to make, some of which, I grant you, are far more applicable to general material than to medical literature. First, I believe that we all should pay more than lip service to the problem of simplicity. When I was reading those state medical journals four years ago, naturally, I ran into a great deal of polysyllabication, coinage, and combined words. I suppose that the American language in this country, like many other things, has taken many qualities from German and other languages, including that business of building words. I frequently wonder if some of you could possibly understand, because of polysyllabication, some of the material you do read in the journals.

I think we should all remember that, with the exception of scientific and technical terms, one can be reasonably simple. I am reminded of what Lewis Mumford said about a book. I think it applies to an article or anything else equally well. Mr. Mumford said, "A book has one leg on immortality's trophy when the words are for children and the meanings are for men."

I know of no way of making it clearer that I think we sometimes use 10-dollar words when the brief, direct, simple method of expression would help.

I was talking this morning to one of Chicago's most brilliant residents. He is a scholar in his field, the field of semantics. He knows how to use big words. He uses them when he is talking to someone who understands them. He wrote a little book that I recommend to you heartily, not, I regret to say, published by my firm, called "Language in Thought and Action," and it deals only with the process of communication.

When he was talking to me, because he thought I would understand some of his words, he used the first words that came to mind, whether they were brief or had five syllables. When he writes for a popular audience, he uses simple, direct words, and he doesn't drum it down, either. He works over and over his writing to be certain that it is simple.

Don't forget, the book has one leg on immortality's trophy when the words are for children and the meanings are grown-up. That helps communication, I think, more than any other single quality I can think of.

I am going ever far afield now, because I am going to say that except for medical literature, all good writing has a conversational quality. One of the great writers, one of the really twenty or thirty great writers in English literature, in my opinion, was a chap named Lawrence Sterne. He once wrote: "Writing, when properly managed—" and being Sterne, he put in parentheses "(As you can be sure I think mine is)—when properly managed is but another name for conversation."

I think, frequently, the material that I read sounds as though the author had set himself up on a pedestal and were looking askance at his poor ignorant readers.

Fifty years ago much nonfiction writing in this country was polysyllabic, was stuffy and dull. Not any more. You know what has happened, and you can see that there is a conversational, man-to-man, woman-to-woman quality of style that you didn't find in ponderous articles of forty or fifty years ago.

Third, I believe that communication, which, in my opinion, is the most significant literary aspect of any kind of writing—I believe that communication can be helped if the author will forget everything except his knowledge and his desire to communicate that knowledge to his readers; if he will play down the first personal pronoun and play up the second person. Down with the "I" and up with the "you" of the reader.

I sometimes think that the most important and significant statement that has ever been made on the subject was made by Schopenhauer, whom some of you may remember for other reasons. I have quoted it to a hundred audiences and I think I can quote it to you. Here is what Schopenhauer said: "A writer commits the error of subjectivity when he thinks it enough if he himself knows what he means and wants to say and takes no thought for the reader who is left to get at the bottom of it as best he may. This is as though the writer were giving a monologue; whereas it ought to be a dialogue in which he must speak all the more clearly, inasmuch as he cannot hear the questions of his interlocutor. Nor will this result be attained unless he remembers that the words must be so set down that they directly force the reader to think what the author thought when he wrote them. The author must always be careful to remember that thought so far follows the law of gravity that it travels more readily from head to paper than from paper to head.

I think we ought to keep that in mind. Another literary aspect that is enormously important in this process of communication is that of being concrete. I know I am on familiar ground here, because I am sure that the one thing I remember from my reading of state medical journals four years ago was that my interest quickened when I saw the actual name of a person or the physical characteristics of a person or the age stated of the patient. In other words, my interest was aroused by case histories. What you were doing then was being concrete. You were being specific.

I made the comment at the time that I thought there were far too few references in the material I read; too few specific conditions, problems, and troubles of patients. That may not be true, but I do know this, that nine-tenths of all that comes into our heads comes in as itemized bits of experience. When you are a young child and your mamma or nurse or father or big brother or sister let you go along with them when they went out some place, you toddled along the street, and he or she would point to a four-legged thing and say, "Dog. See the dog." And later spell it, d-o-g, and ever since, as a concrete specific thing, you had that in your mind.

I think we do far too little of that in our writing. I think we use abstract material, abstract concepts far too often, symbols like "democracy" and "truth" and "freedom" and "virtue." For all I know, medical ethics should be included in that list, too, but, until we give concrete, specific examples we are not communicating.

I think another thing that I might suggest—and I grant you that this can't be done too frequently in medical journals; at least, I assume it can't—is to use the material tested qualities of narrative writing. I will admit you can't tell many funny stories, and I suppose you can't use too many narrative helps when you are attempt-

ing to give a clinical finding or whatever it is you are reporting, but I have done much reading in my time and as an editor—I do a lot now—and from this I find that what sticks in my mind are the narrative incidents, the things that make a point, because they are applicable. It is the telling of anecdotes, the specific incidents, that stick in my mind long after I have forgotten the remainder of the manuscript.

I remember reading a very poor book on George Washington by a man named Rupert Hughes, and I can remember a dozen incidents from that book and nothing else. I can remember the business about George Washington's wooden false teeth. I can remember about the night Hughes says Washington danced all evening with the wife of his favorite general. Things like that stick in one's mind, because they are concrete and they are narrative.

I can remember a story about another great American, Robert E. Lee, who, after the Civil War, as you recall, became president of what was then Washington College and is now Washington and Lee University. He acted as president and dean, and on one occasion he had to call in a recalcitrant sophomore. He told him he was making a nuisance of himself and generally failing in the work. The word "sophomore" means "wise fool."

"Yes, General," said the sophomore, "but you made a monumental failure yourself," and Lee said, "Yes, but yours is a new generation, and I am counting on you to be more successful."

I can remember such incidents because they would tell me more about the humility and the genuine greatness of Lee or whoever it was than a dozen or fifty pages of straight exposition.

I don't remember much of the history I read in school or college, but I can remember things like that. I grant you that perhaps they are wrong in one sense, because they give a false impression, but I remember much about the ecclesiastical minds of members of a church when they were responsible for having a rooster hung because he was reputed to lay eggs. It seems to me that that is an illuminating incident that will tell you more than many pages of exposition.

I have a friend who is a writer. I shan't mention his name, but I will identify him as one of a half a dozen well-known magazine writers in the country. He was doing a biographical study of Chief Justice Hughes. He was talking to one of Hughes's daughters and asking for facts and stories about her distinguished father, and he said, "I understand that the Chief Justice is very interested and concerned about his health and I have even heard that he takes sitting-up exercises and does balancing stunts and so on." She said, "Yes, I will tell you a little story about that if you will promise not to use it. Father goes around the room for fifteen or twenty minutes a day with an orange balanced on his head, because he has heard it would keep him young."

The writer did not use the story, but, if he had, it would tell you more about the humanity of a great or a brilliant man, about his humanity, his essential humanness, than would straight exposition.

An apocryphal story is told about Rudolph Valentino, the Sheik, the Great Lover, how, upon his death, in order to recoup some of the financial losses that had been involved, particularly by the motion picture industry, his body was lying in state. I don't believe this story is altogether true, but in some ways it is truer than the truth itself.

His body lay there for two or three days and long lines of persons passed by his bier night and day. After the first day there was a curious discovery made by all the grocers in the neighborhood. Of course, almost—forgive me please, ladies—but almost all the persons were women. Finally, the discovery was made that the grocery stores were almost out of onions, because the ladies were buying onions, chopping them up, and stimulating tears.

I don't know whether that is true, but it would teach me something about the attitude of persons who would stay up all night just to go by the body of a person like Rudolph Valentino—no discredit to him.

I think what I am trying to say is that communication can be helped greatly in terms of simplicity, in conversational quality, by writing with concreteness, by avoidance of subjectivity, and by the use of inference.

Let me pass on quickly to the second of my three principles, which applies less here than it does to most types of writing and editing. It has to do with incubation.

I like to believe that for general writing a person should always have two or a dozen ideas rubbing together in his mind. I used to tell students that they should learn to write with a dry pen, meaning that they should write constantly, whether they had a pen or a pencil in their hand or were at their typewriters. I don't know but what I think doctors could and should do more of that, far more.

I would like to point out to you now that I believe the literary aspects of medical journalism and all types of writing would be considerably improved if the authors were to incubate their material longer than they do. I sometimes use this analogy: that the research, thinking, studying, experience, observation, and so forth that go into the getting together of the material bear about the same relationship to the actual writing that the part of an iceberg under water does to the part above. I think that is about seven-eighths.

It is quite likely—and I will admit this freely—that you gentlemen, in writing for medical journals, would have spent seven days or seven weeks or seven months or seven years or longer in getting together that material. I don't mean to say that you should spend one-seventh longer if you spent seventeen years in writing the piece, but I think that perhaps we write much too quickly. I have no reason to think that doctors are different from other writers in this respect: that if, after they have finished the draft of an article, they would put it away on a desk or in the drawer and let it soak for as long as possible, they would be able to come back to it and polish it so it would be considerably more communicative.

There is a detachment that time gives in which you can see the faults, the glaring faults, stylistic and literary, in your own material after the passage of time that you can't see after you have just finished writing.

I know a very well-known editor of a magazine, an editor-in-chief, who flatly refuses to read any manuscript on Monday and Tuesday of each week. He calls them—and I can't use his exact words, but you can imagine—he calls them blank-blank week-enders. He knows that the mail is flooded with contributions from persons who came home from work Saturday night, got the idea, wrote it Sunday morning and put it in the mail Sunday afternoon. Many good writers know this and don't send material so it will arrive at that magazine on Monday or Tuesday.

I think the business of soaking your material for a while is precisely the business of a housewife soaking the clothes overnight. You can't see your mistakes in your

own manuscript, but pick up somebody else's and you can see them. Try to get a little detachment and objectivity. That will take time. I don't believe, however, that ordinarily articles in medical journals are so timely, so pressing that they can't afford to be held up for a day, a week, or sometimes for a month.

You see, what I am really trying to tell you is that the real art in the editing of medical journals or anything else consists of getting good material and the transmission of that information by all effort from the mind of the conceiver to the mind of the reader, and I think incubation will help greatly.

Third, I would like to say that there is no such thing as good writing—there is only good rewriting. And, of course, that is a dogmatic statement. You may recall that Shakespeare never blotted a line, or you may have heard about Edgar Wallace and his dictaphone or E. Phillips Oppenheim or other writers, and you may say it didn't take longer than thirty minutes.

The point is that this is not original writing, but what they've been writing for weeks, months, or years. How many of you lie awake at night sometimes and dictate to yourselves the letters you are going to dictate to your secretary the next day, and how many talk over with yourselves the paragraphs of an article or a speech you are going to make?

I don't think a night ever passes when I do not do it, and think you do it, too, in the same way. If you think it over and incubate it, you might have written it over a hundred times before. And I think that applies to Shakespeare and other writers, only he was a genius, so rules won't apply to him.

I am assuming you wouldn't be here if you thought medical writing was beyond improving. I am assuming an improvement could be made. I am assuming you must take a leaf from the book of a professional writer. Writing is a tedious, laborious, lonely, time-consuming business. It is lonely to sit for hours and hours with no one else around, but you have to write in a lonely way, and it takes time.

I once asked a well-known writer, the same man I spoke of in connection with Chief Justice Hughes, how long it took him to write a profile for the *New Yorker*, four or five thousand words. He said, "Well, if I know my subject thoroughly, if I have talked to him or her and read everything he or she has ever written and talked to their friends and enemies and spent several weeks getting it all together and if I really know my subject . . .," and, as I would say, thoroughly incubated, "then I can write six hundred words a day, but if I write that much, I will have to start over the next day," he says, "because, after twenty years of writing professionally for a living, I can write only five hundred words a day that will stand up."

That is, roughly, two typewritten pages, doublespaced. I imagine that you and I have on occasion written an entire speech or a three or four thousand-word article in an afternoon, but here was a competent professional writer who could write five hundred words a day if he knew his subject. When I say "a day," this particular gentleman wrote about five or six hours, and if you can think of a harder way than to sit at a desk or typewriter all alone for five or six hours in order to make a living, I would like to know what it is. I think, in other words, we need to take time, a lot of time.

Now, suppose you say this to me. Suppose you say, "I am just getting across information. I don't have to have any literary quality." I say it does have to have this quality or it won't get across. Or you might say, as a few persons have said,

"I write only to please myself." Well, you see, the trouble with writing to please oneself is that oneself is frequently too easily pleased. You have no right to write only to please yourself, but you have to communicate with the reader, or so I think.

Now, let me get down to what, in nonmedical material, are a few specifics. I can't remember the titles that I read a few years ago, but I still believe that titles are more important to some persons than they are to the motion picture industry, and I wonder if, in terms of both typography and wordage, you could possibly improve the literary aspects of medical journalism by paying a little attention to merely the titles of the articles.

There are two qualities that titles should have, according to most of the so-called experts. A title should be descriptive, and it should be arresting, attention-getting. Well, I found some titles in my reading four years ago that were certainly descriptive enough, but they were not arresting. They were long; they had no action words in them. They were polysyllabic, complicated, and involved. I think a short example might be helpful.

Do you suppose it would be all right if I told that same story I told before? I have a good many illustrations of titles. I can think of one of them which doesn't apply at all to what I am talking about specifically, but which might amuse you.

A good many years ago, E. Haldeman Julius, the man who started the Little Blue Books and sold them for a nickel, made a very careful study of titles, because he knew from experience that titles were responsible for sales in newsstands and railway stations, and so on. On one occasion he brought out one of the most famous short stories of Guy de Maupassant, which in French is called "Boule de suif," which can be literally translated as "The Tallow Ball." He put the book on the newsstands with that title, and it didn't sell at all. Then he pulled it back in, ripped off the covers and this time gave it a title that is as descriptive, more accurate, indeed, and somewhat more arresting. He tripled the sales overnight with this new title, which was "The French Prostitute Sacrifice."

Well, I am hardly advocating that you should come out with titles like that in the *Medical Annals of District of Columbia* or West Virginia or other journals, but I do think that sometimes you can get more interest with titles. In connection with that, I should like to say something about leads. I don't think my comments a few years ago went down particularly well when I suggested occasionally doing a twenty or fifty-word summary of the essential part of the article which could appear preferably in the front of the article or, indeed, in the front of the advertising matter. But I do think that sometimes we don't pay enough attention to getting started. We will do one of two things: we will start dully, "in medias res," as the Greeks would say, or we will wind up for a page or two before we really get to the heart of the thing. Sometimes we can begin with a narrative incident, tell a question and answer, or in some way get the attention of the reader.

Now, I know the reason for this, which may not be apparent to you. I am trying to explain to you that I think medical journals are probably not read as fully, as carefully and with as much entertainment (and when I say that, I think there is entertainment of all kinds) as they should be. I think a good lead would help.

I used to know a free-lance writer who is making a sizable sum of money today as a free-lancer, largely for the *Reader's Digest*. I have seen him spend as much

as three days on the lead for his article. But, of course, he was unusual, because he blocked out his story or his article a page at a time, and he couldn't go ahead and write page 2 unless he was completely satisfied with the lead page.

Most of us use what I chose to call the snow-shovel technique. We will push into an article, and we will go as far as we can; stop, and start over on the next page. My own belief and my conclusion from what writing I have done is that you should go ahead and write, hell bent for leather, as fast as you can and pour out your ideas and information, let it soak and then come back and start the rewriting.

The qualities of a good title should be the qualities of a good lead. They should be descriptive; they should be arresting.

Early in my so-called career I made a little money attempting to do some advertising copy writing. I learned that there were four things that a good piece of advertising copy was supposed to do—supposed to do then, but now you do it or, as a copy writer, you are fired. The copy of one of Verdi's operas, "Aïda," will give you the point: "Attention, interest, desire, and action."

I think that the title and lead of almost any kind of writing, including an article, ought to get the attention of the reader. Getting his attention and interesting him are two different things. You can get his attention with a phony title. You might get his interest with an impelling lead. You must get attention and interest, sufficient interest to make him desire to read on through.

I wonder how many editors in this room feel that every article in their publication is read from beginning to end, or that any one of them is, or that more than one in a given issue is.

Thus, the article must evoke attention, interest, desire, and, finally, action, which might better be called reaction; that is, the intent of the reader to do something about it, to keep it in mind, to act on it, to remember it when he goes to a grocery store again or when he is treating a patient with such and such symptoms.

I think this is important, and I think it would improve the literary aspects of your journals considerably if more of that were attempted.

Again, there was considerable discussion when we met together four years ago about the duties of the editor in improving the stylistic qualities of the material. Well, I think one has the duty of creatively editing material, particularly the editing of an article you have to publish "or else." It is up to you to make your material as attractive as you possibly can. I believe you should take care of the real mechanics of writing, by which I mean the syntax and punctuation and so on, and I believe it is also the duty of editors to watch out for the two worst vices that occur in all professional writing. I am pretty blunt about that, because I have read some of the polysyllabication and triteness and big words, so I know. I am not talking about writing that is studded with scientific terms, long terms that you can't avoid, but I am talking about ordinary adjectives and adverbs and even conjunctions that don't have to be that long and can be cut down. I think it is the duty of the editor to cut them down. Of course, if the writer insists that it be printed the way it was written, you can do it, or you can refuse, but that would depend upon the strength of him or the community or the recipients. Maybe I wouldn't do it.

The chairman of the board in our hospital has his personal charge, one of the most famous authors in America, who insisted that something be printed and that

the thing be printed exactly as written. The chairman of the board refused, and he lost the writer. I think that was integrity. I think they should go ahead and make changes they know are necessary to make.

I think that triteness and the use of clichés appears in too much professional writing. Why? Because you are intent on the meat of your material and the particular case history, the clinical observations or whatever it is that you are writing about, and for the connecting words you use the first word that pops into mind. Well, the first words that pop into mind are those old, familiar phrases, naturally. We hear them all the time. I have probably used twenty or thirty in talking to you in the last thirty minutes. That is all right and understandable, but if I were any part of a writer or editor and saw the typed manuscript of what I was saying, I would try to get them out. They help in conversation but not in writing.

I think I can conclude my remarks with two or three observations about general trends in living or in anything. I know this sounds awfully pontifical and pompous, possibly, and I don't mean it to be that way, but there are the things that concern me every day in my professional work as a publisher.

As editors, we have to watch trends. We have to sign up manuscripts that won't be ready for another two or three years and won't be printed for another four or five.

Mind you now, these are just vague suggestions. I think the one thing that has influenced general publishing, of both magazines and books, as much as any other thing in the last five or six years, maybe the last ten, is the growing consciousness that editors and publishers have of the deep, underlying feelings and fears of most persons. Now, perhaps they are neuroses and perhaps they are more or less normal fears, and perhaps not everyone who is frightened is psychotic, but we see it constantly, and if you take a look at the general magazines, whatever you read, the *Reader's Digest, Ladies Home Journal,* or *Time,* you will find an increasing amount of attention has been given to that.

I don't want to start an argument, and I am speaking entirely from ignorance, but I suspect that more and more of that will obviously have to be reflected in medical journals. I know that the few doctors with whom I am on generally good terms are paying more and more attention to the "whole man."

My language isn't exact, but I very well know that I need call to your attention only a couple of titles to make my point. One of them was a book called "The Mature Mind," and a large part of it concerns fear and psychoses of various kinds and fright or sheer worry. Or I might mention another one called "Peace of Mind." I don't care whether you think they are good or bad. I am simply trying to say that they have influenced hundreds of thousands of persons. I suspect that in time perhaps some of the approaches that as a layman I would loosely call psychosomatic will possibly come into medical journalism as certainly it has in general literature.

If you know where I could find a good manuscript that deals with the mature mind and the peace of the soul, I will sign it up this afternoon gladly and make a cash advance.

Second, I know that medical journalism has different names, but I should like to point out one thing that may happen in medical journalism as I am told it has come in medical education. There is increasing evidence of visual techniques, actual demonstrations.

I once had occasion to make a study of picture journalism in this country, the enormous influence of *Life* and *Look* and even some gorgeous new picture books, which I hope some of you will be buying soon.

I realize just what has happened to production costs and manufacturing costs and how composition and binding costs and even mailing costs have spiraled. I know how much it costs to reproduce large drawings and halftones, but I am wondering if the actual literary aspects of medical journalism couldn't be increased sometimes by a few accurate but imaginative pictures. I am not talking about a host of photographs about the different stages in an operation, but there is a lot of medical photography, and I am wondering if sooner or later you can afford to come to it. I know the general public has.

After all, we are "snooty" persons, most of us who work with words. Words are not democratic at all. Language has always been a series of symbols for the élite. Pictures are democratic. Picture language is the most democratic language the mind of man has ever devised. Anyone can look at the pictures and get something out of it, but that is not true of words.

I have mentioned the influence of the picture magazine. I should like to conclude by mentioning the influence of digest magazines. If you look at the magazines today, you will find that the articles have grown increasingly shorter for the last twenty years. There may be more articles, but the articles themselves are shorter and are constantly getting shorter.

I think that if, in medical journalism, the same thing is true that is true in general publishing, if they were cut a little more, they might be improved. I am not holding up the flag for the *Reader's Digest*, except to say that they do a superlative job and frequently improve the original. They make a fetish of it, it is true.

I know a well-known writer who was commissioned to do a treatise for the *Reader's Digest*. He worked for weeks and weeks and sent the article in. A short time later he got a note from one of the editors saying, "Well, it is very good, but not exactly right. You know, not the right level."

The writer showed it to a friend of his, also a writer. The friend did a very shrewd stunt. He said, "Let me see the draft of the article just prior to the one you sent in." The other fellow said, "There is no point in doing that. The only difference was I just cut out one paragraph." The friend then said, "Send in that draft and leave that paragraph in."

He did that. The *Digest* knocked out that paragraph, accepted the article, and paid him a tidy sum. As soon as they saw there was something to knock out, everything was fine.

I recognize the somewhat limited source of material from which you have to draw. Maybe they write ten times as much as you can publish. Maybe you have to publish most of what you receive. Maybe some of you ask physicians for articles or simply print speeches that they have made at various learned conventions. But I think if those speeches were always edited they would be improved and frequently condensed.

What I am trying to say is that I think that the literary aspects of medical journalism might be improved—and I say might be improved—if some of the articles were shortened, and perhaps more could be printed.

Finally—and I recognize this is far afield—I think that aspects of living in this country have made it inevitable that literature in general must have a far greater degree of sprightliness than it ever had. It seems to me that writing isn't necessarily better. In fact, I think it is frequently very poor, indeed, and the quality of fiction writing in this country is at an all-time low as far as I can tell, but there is sprightly quality about general publishing that I think has come as an answer to some very devastating counterinfluences. Certainly, I don't need to point out to you that almost within your lifetime and mine certainly, not much more than fifty years, in the Twentieth Century, four things have come that have had a terrific impact on our reading habits.

I refer, of course, to automobile, movies, the radio, and now television, and I suspect that whether or not your medical journals had high degrees of high literary quality, more and more tired doctors would be looking at more and more television programs as time goes on, just as they have been going to movies or listening to the radio. I think that general publishing is certainly taking that into account.

OTITIS EXTERNA—A CONTROVERSIAL SUBJECT

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DURING the past three decades there has been great controversy and confusion in the literature with reference to the etiology, the physiopathology, and the treatment of otitis externa. It is only in the last few years, and especially those of World War II, that any clarification of the subject has begun to appear.

Much of this confusion arose over the fact that otitis externa is a general term used for a number of different pathological conditions whose chief point of resemblance is that they are located in the external auditory canal. It is obvious on reviewing the literature that while one observer is referring to one type of condition, another may be talking about an entirely different etiological type. Under such circumstances the conditions, specific treatments, and results cannot be compared.

For the purpose of this discussion we shall consider chiefly the question of "infectious" otitis externa. By the term "infectious" we mean that type presumably caused by pathogenic organisms or fungi.

It has been estimated that otitis externa constitutes from 5 to 40% of all cases encountered in otological practice in the United States.[1a] This wide variation is due to sectional differences in temperature and humidity. It is most common in the southern portion of the country. Nelson[2] reported that it constituted from 50 to 70% of disease seen in United States service personnel in the South Pacific area during the past war and that it varied in incidence and etiology from island to island and from season to season. It is a mistake, however, to believe that otitis externa is confined exclusively to such warmer areas, as it occurs, especially in the summer months, in the colder climates. This is particularly true in our section of the country (Quebec) where in the summer months it is a very common and troublesome condition.

Prior to World War II it was felt that otitis externa was chiefly a disease of fungus origin while occasionally one encountered a true bacterial type of infection.

Presented at the Research Study Club, Los Angeles, Jan. 18, 1952.

1. (*a*) Fabricant, N. D., and Perlstein, M. A.: pH of the Cutaneous Surface of the External Auditory Canal: A Study of 27 Infants, 44 Children and 60 Adults, Arch. Otolaryng. **49**:201 (Feb.) 1949. (*b*) Fabricant, N. D.: Modern Medication of the Ear, Nose, and Throat, New York, Grune & Stratton, Inc., 1951.

2. Nelson, R. F.: External Otitis in the South Pacific, Ann. Otol. Rhinol. & Laryng. **54**:367 (June) 1945.

Many observers emphasized the fungus origin of this condition [3] while others [4] reported series of cases in which the predominant flora had been bacterial.

It is primarily due to the excellent work of Senturia,[5] W. D. Gill and E. K. Gill,[3a,b,c] McLaurin,[4a] Fabricant,[1] and others during and since the war years that the subject of etiology and treatment has reached its present state.

It is now generally accepted that the majority of cases of "infectious" otitis externa are of bacterial origin [5a] and that not more than 15 to 20% at the most are of fungus origin.[6] Mixed infections in varying percentage are encountered, and it is difficult in many cases to assess their true precipitating etiological importance.

Reports on bacterial studies in otitis externa show that the predominating organism is the Pseudomonas aeruginosa (Bacillus pyocyaneus), while Staphylococcus pyogenes, hemolytic streptococci, diphtheroids, and Escherichia coli (Bacteria coli) are the offending factors in many cases.[7]

According to Hayes and Hall,[8] otogenic infections in the temperate zones are essentially of two types: a winter type due to Gram-positive organisms, and a summer type due to Gram-negative organisms. During hot weather there is a great increase not only in external otogenic infections but also in exacerbations of chronic otogenic infections that have been artificially activated by swimming, excessive sweating, and bathing. The primary infective agent in the latter group, they point out, is the Gram-negative Pseudomonas aeruginosa.

Price [9] feels that the bacterial flora of the normal skin can be divided into a fairly stable resident and a varying transient population. There are considerable changes in the number of bacteria found on normal skin from time to time and this to a great degree is influenced particularly by heat and moisture. Sometimes pathogenic bacteria suddenly become members of the resident flora of the skin and they

3. (*a*) Gill, E. K.: Otitis Externa Mycotica: Comments Concerning the Prevalence, Diagnosis and Treatment of Otomycosis, Arch. Otolaryng. **16**:76 (July) 1932. (*b*) Gill, W. D.: Otitis Externa, Ann. Otol. Rhinol. & Laryng. **51**:370 (June) 1942. (*c*) Gill, W. D., and Gill, E. K.: Otitis Externa: Some Comments Concerning Present Status of Therapy, South. M. J. **43**:428 (May) 1950. (*d*) Reeh, M. J.: Treatment of Otomycosis, Ann. Otol. Rhinol. & Laryng. **51**:146 (March) 1942. (*e*) Whalen, E. J.: Fungous Infections of the External Ear, J. A. M. A. **111**:502 (Aug. 6) 1938.

4. (*a*) McLaurin, J. W.: Principles of Therapy in Otitis Externa, Laryngoscope **61**:66 (Jan.) 1951. (*b*) Mitchell, J. H.: Streptococci Dermatoses of the Ear, J. A. M. A. **108**:361 (Jan. 30) 1937. (*c*) Williams, H. L.; Montgomery, H., and Powell, W. N.: Dermatitis of the Ear, ibid. **113**:641 (Aug. 19) 1939.

5. Senturia, B. H.: (*a*) Etiology of External Otitis, Laryngoscope **55**:277 (June) 1945; (*b*) Treatment of External Otitis: I. Local Sulfonamide Therapy, ibid. **54**:277 (June) 1944; (*c*) Diffuse External Otitis: Its Pathology and Treatment, Tr. Am. Acad. Ophth. **55**:147 (Nov.-Dec.) 1950.

6. Gill.[3c] McLaurin.[4a]

7. Greaves, F. C.: Phenyl Mercuric Nitrate in the Treatment of Otitis Externa and of the Dermatophytoses, U. S. Nav. M. Bull. **34**:527 (Oct.) 1936. Fabricant.[1b] McLaurin.[4a] Senturia.[5a]

8. Hayes, M. B., and Hall, C. F.: A Newer Concept of the Management of Otogenic Infection, Arch. Otolaryng. **47**:289 (March) 1948.

9. Price, P. B.: The Bacteriology of the Normal Skin: A New Quantitative Test Applied to a Study of the Bacterial Flora and the Disinfectant Action of Mechanical Cleansing, J. Infect. Dis. **63**:301 (Nov.-Dec.) 1938.

may be extremely persistent and difficult to dislodge. Bacterial cultures obtained from normal surface epithelium frequently show Staphylococcus aureus and albus,[10] streptococci of the hemolytic and viridans groups, Pseudomonas aeruginosa, and diphtheroids.[11] Under such circumstances, if any breakdown should occur in the defensive mechanism of the skin, these organisms will gain entry and set up a disease process.

Over 50 different species of fungi have been reported to cause otitis externa mycotica, or, as it is commonly called, otomycosis.[5] The predominant fungus, found in over 90% of such cases, is the filamentous Aspergillus, with its three common types, niger, flavus, and nidulans, while occasionally one encounters penicillia, Actinomycetaceae, Candida (Monilia), Mucoraceae, pathogenic yeasts, and certain of the Taenia group.[12]

These fungi are often obtained on routine cultures of normal ears and their mere presence does not imply that they are pathogenic. Mycologists point out that the fungi cultured from otomycotic infections are invariably nonpathogenic saprophytic organisms which confine themselves to the surface epithelium and that true pathogenic fungi, such as the trichophytons, are rarely found in the external auditory canal.[5a]

Fungi are seldom isolated from the ear canal in pure culture but are usually accompanied by bacteria. There is no certainty as to whether fungi are primary or secondary invaders. In fact, the external auditory canal does not favor fungus multiplication when it is normal but only when its cutaneous physiology is altered.

As emphasized recently by Fabricant [1b] an understanding of the anatomy and physiology of the skin assists materially in the intelligent use of medication in diseases of the auricle and external auditory canal. He points out that through its component parts the skin serves not only as a protective coat, but also performs a number of physiochemical functions vital to life and to the general body economy. Fabricant feels that the problem of the management of infections of the skin cannot be dismissed simply by a discussion of the diseases produced, the bacteria concerned, and the advantages or disadvantages of the various antibacterial agents now available. He thinks a better understanding of the manner in which skin resists and harbors bacteria and of some of the mechanisms by which bacteria produce harmful effects is most important. Several factors appear to play a role in the protection afforded by normal human skin against bacterial invasion.

One of the chief factors is the pH of the skin. Through the work of Blank,[13] Bernstein and Herrmann,[14] and Fabricant and Perlstein,[1a] it has been shown that normally the pH of the skin is on the acid side and that in cutaneous disease it

10. Downing, J. G.; Nye, R. N., and Cousins, S. M.: Investigation of the Fungous Flora of Apparently Normal Skins, Arch. Dermat. & Syph. **35**:1087 (June) 1937.

11. Friedman, H. S., and Hinkel, C. L.: External Otitis, Arch. Otolaryng. **33**:749 (May) 1941. Senturia.[5b]

12. (*a*) Gill, W. D.: Otomycosis: Some Remarks Concerning Its Prevalence, Symptomotology and Treatment, South. M. J. **40**:637 (Aug.) 1947. Minchew, B. H.; Collins, B. E., and Harris, M. M.: External Ear Disease with Special Reference to the Fungous Type, ibid. **33**:1345 (Dec.) 1940. (*b*) Fabricant.[1b] (*c*) McLaurin.[5a] (*d*) Whalen.[3e]

13. Blank, I. H.: Measurement of pH of the Skin Surface: I. Technique, J. Invest. Dermat. **2**:67 (April) 1939; III. Measurement on the Arms of Children with no Apparent Skin Lesions, ibid. **2**:231 (Oct.) 1939.

14. Bernstein, E. T., and Herrmann, F.: The Acidity on the Surface of the Skin, New York J. Med. **42**:436 (March 1) 1942.

tends to shift to the alkaline side. This normal acid pH is dependent on several factors which Fabricant [1b] lists as follows: (1) cornified surface cells which are more acid than any other cutaneous tissue; (2) sweat with a pH varying from 5.73 to 6.19 and which also has marked fungistatic and fungicidal properties; (3) secretions of the sebaceous or oil glands; (4) the apocrine glands, which are probably the chief producers of the odoriferous cutaneous secretions.

Senturia [5c] recently showed that in diffuse otitis externa there is, owing to excessive sweating in susceptible individuals, a marked hyperkeratosis of the skin of the ear canal with plugging of the ducts of the sweat and sebaceous glands. If this insult is repeated, the glands are unable to pour their protective secretions onto the skin and there is a shift in the cutaneous pH towards the alkaline side. As a result of the skin changes so produced a surface infection may readily develop.

In view of these observations it is important to remember in the treatment of otitis externa that one should endeavor to restore as soon as possible the normal condition of cutaneous acidity, and medications used should provide for this.

In bacterial cases the question of sensitivity of organisms to the various antibiotics must always be considered. At the present time we have found that it is utterly useless as far as therapy is concerned to request only morphological identification on bacterial cultures and it has become our routine to have tests of sensitivity of the various antibiotics done. During one period recently over 60% of all Staphylococcus pyogenes isolated by a bacteriological department of a hospital in our area showed varying degrees of resistance to penicillin in vitro.[15] This indeed emphasizes the importance of bacterial sensitivity tests today.

There are certain predisposing factors which play a varying role in otitis externa, and it is important during treatment to eliminate them if possible or to counteract them. Among the most important appear to be temperature and humidity. It is well known that the condition occurs most frequently in hot humid areas, where it is endemic and on occasions epidemic. It is more prevalent among the poorer classes in whom bad hygienic habits tend to be common. Swimming or bathing with failure to keep the ears dry has a marked influence on the incidence. This is especially so in our section of the country, where the condition is more or less limited to the summer months and in many cases follows the introduction of water into the ear canals during swimming. Constitutional defects, such as allergic tendencies, metabolic imbalance, anemia, vitamin deficiency, and chronic disease processes, are commonly found.

TYPES OF OTITIS EXTERNA

Clinically, according to Senturia,[5a] otitis externa can be divided into the following types:

1. Acute
   - *a.* Circumscribed — Mild
   - *b.* Desquamative (Diffuse) — Moderate / Severe

2. Chronic
   - *a.* Suppurative — Otomycosis
   - *b.* Eczematoid — Neurodermatitis / Eczema

15. Personal communications to the authors.

Acute external otitis includes all those cases with a history of recent onset of pain, tenderness, etc., while the chronic category embraces all cases with a prolonged history of external ear complaints.

The acute circumscribed type (otitis externa circumscripta) is more commonly known as furunculosis. The desquamative external otitis group is composed of those acute ear conditions which show widespread involvement of the squamous epithelium of the canal.

The term chronic suppurative external otitis refers to those cases which show a heavy gray or green discharge which, when removed, reveals a thickened discolored epithelium coated with a thin diffuse white exudate. Chronic eczematoid external otitis includes the many varieties of itching, weeping, vesicular, and dry crusted conditions which have been at various times called eczema, allergic external otitis, or neurodermatitis. In the latter group Senturia placed the cases of true otomycosis, since in these cases patients complain mainly of itching, a feeling of fulness in the ear canal, and occasionally some difficulty in hearing.

Acute Circumscribed Otitis Externa (Furunculosis).—Furunculosis is due to infection of the hair follicles and sebaceous glands by Staphylococcus aureus or albus.

For a proper understanding of this condition one must be familiar with the anatomy of the external ear canal. The total length measures 35 mm. The outer one-third of the canal consists of a membranocartilaginous base continuous with that of the auricle, while the inner two-thirds is bony. In the outer third numerous hair follicles are found in association with large sebaceous and ceruminous glands. These glands are absent in the bony parts. For this reason furunculosis occurs only in the outer third of the canal. The epidermal lining of the external auditory canal is closely adherent to the perichondrium and to the periosteum, with almost no intervening loose connective tissue. A furuncle developing in the canal may become extremely painful, because it is under considerable tension and is unable to expand in loose connective tissue. The pain may soon reach a point out of all proportion to the size of the lesion.

Furuncles may be single or multiple. In its superficial form the furuncle may present a small, red, circumscribed swelling on the skin of the canal, but if it is more deeply seated the swelling is usually more diffuse. In some cases the canal may become almost completely occluded with an associated marked cellulitis of the auricle. Movement of the jaw or the auricle will increase the pain.

Periauricular swelling frequently corresponds to the location of a furuncle within the external auditory canal. If the lesion is on the anterior wall of the canal, the preauricular lymph nodes become swollen, and if it is on the posterior wall, the postauricular nodes will be involved.

Acute Desquamative (Diffuse) Otitis Externa.—This type can be subdivided into three groups according to the severity of the condition. These are the mild, the moderate, and the severe types.

In the mild cases patients complain of a tenderness on touch or manipulation of the auricle and a feeling of blockage of the ear, and show some adherent desquamated epithelial debris on the wall of the ear canal. Moderate cases include those in which there is pain on movement of the auricle, some edema and cheesy desquamated material over the canal wall, and slight periauricular adenopathy.

The severe external otitis cases present systemic symptoms, severe pain on movement of the auricle and mandible, auricular cellulitis, periauricular adenopathy, and a very reddened and edematous canal wall coated with serous or cheesy debris. This edema of the canal may be of such a degree as to completely occlude the lumen.

As has already been mentioned, Senturia[5c] showed in such cases that as a result of excessive sweating a marked hyperkeratosis of the skin of the ear canal occurs, with plugging of the ducts of the sweat and sebaceous glands. If recovery is not allowed to occur before another period of exposure to a hot, humid environment, these glands are unable to pour their secretions onto the skin. As a consequence of the skin changes produced, a surface infection may readily develop. Senturia feels that diffuse external otitis is not primarily caused by bacteria or fungus infection, but rather that these are secondary to the loss of skin resistance.

Otomycosis.—Otitis externa mycotica, or otomycosis, is an inflammation of the skin of the external auditory canal due to implantation and growth of pathogenic fungi. The infection may be of a mild, a moderate, or a severe degree.

In growing, the fungi affix themselves to the top layer of epithelium, where they produce a degree of mechanical irritation by their presence. In addition, an exotoxin is produced which adds to the irritation.

Cerumen is believed to exert an inhibitory effect on fungus growth, and in most instances of otomycosis it is absent from the external auditory canal. There appears to be a definite suppressing effect on the ceruminous glands in this type of infection, but this is not an absolute rule, as occasionally one will encounter a well-established colony of mold growing on the surface of a ceruminous plug.[12a] The return of cerumen is a good omen, as it guards against reinfection to a degree. However, following the eradication of molds from the external canal there may be no return of function in the ceruminous glands; this indicates a destructive effect on the part of the mold. These observations support the view, which we cannot emphasize too strongly, that the basic factor is an upset in skin physiology and that the infection, whether bacterial or fungous, is secondary.

Chronic Eczematoid Types, Excluding Otomycosis.—These types are extremely annoying and difficult to handle. They are characterized by periods of intense itching, leading the patient to produce additional irritation by his scratching. The canal varies in appearance from a dry scaliness to a pronounced thickening of the skin, resulting occasionally in stenosis. The condition may be localized to the external auditory canal or be part of a similar condition involving the auricle and scalp. The etiology is usually complex and may be secondary to metabolic disturbances, allergic manifestations, or chronic middle ear suppuration.

THERAPY

The essential elements of therapy in otitis externa, according to McLaurin,[4a] are (1) relief of pain or discomfort; (2) cleansing of the external auditory canal; (3) elimination of the causative agent by the use of proper medication; (4) restoration of the external auditory canal to a normal physiologic state.

One of the most distressing complaints, especially in furunculosis, is pain, and prompt, energetic measures should be taken for its relief. This may require the use of narcotics as well as the administration to the ears of heat in various forms. Small doses of x-ray therapy (total dosage not exceeding 300 r) are some-

times useful in limiting suppurative processes and controlling pain. In acute cases in which there is marked swelling of the ear canal, the insertion of a cotton wick saturated with a urea-acetic acid solution, a 5% solution of aluminum acetate, or Burow's solution (2% acetic acid and 5% aluminum acetate with a pH on the acid side) is helpful in decreasing the edema and relieving the pain.

McLaurin [18] states that it is possible to clear up most cases of otitis externa merely by repeated thorough daily cleansing of the ear canal. This can be carried out either by swabbing or by irrigation. Senturia advocated that in the diffuse type the ear canal be irrigated with hypertonic saline in order to obtain drainage and to clear away keratin plugs and debris which have collected in the canal and tympanic sulcus. It is important in such procedures, whatever their character, to be gentle and not to add insult to injury. Thorough cleansing removes debris from the canal and permits medication subsequently to act much more effectively.

As is common in any persisting and perplexing problem in medicine, numerous therapeutic agents have appeared over the years. Some of these have proved effective, while many have fallen by the wayside. In the last 10 years with the introduction of the antibiotics, better understanding of the etiology, and recognition of the basic physiologic upsets involved, more effective therapeutic agents have been made available. However, judgment must still be exercised, in their selection.

In our experience in acute "bacterial" otitis externa the use of the appropriate systemic antibiotic plus local supportive measures gives the best results. As mentioned before, it is our routine to have sensitivity tests done on all our bacterial cultures. In cases of furunculosis we begin treatment with adequate doses of penicillin administered intramuscularly while awaiting culture reports, and if sensitivity indicates we change to the suitable agent. It has been our experience that local antibiotic therapy has little if any value in acute otitis externa.

In cases of recurring furunculosis, we have found that the use of Staphylococcus toxoid may be helpful. It has been our policy to determine the titer of antibodies against Staphylococcus in the blood serum of patients with furunculosis, and if this is low we give the patient a series of toxoid injections.

In furunculosis the question of incision and drainage of the lesion is often encountered. It should never be incised before it is pointing and almost ready to rupture spontaneously. If the condition is not localized and the lesion is incised, there is a marked danger of spreading the infection into adjacent tissue.

In subacute and chronic bacterial cases there are today several promising medications available. Here again it is important to attempt to identify the dominant pathogenic organism present and to establish sensitivities. The local use of the appropriate antibiotic may be helpful in many of these cases. We have had moderate success when Gram-positive organisms were present with bacitracin (200 units per cubic centimeter in distilled water). We have found that it is relatively nonirritating when applied locally.

It is important to remember in using any medication locally that it may be an irritant, and it is a good rule of thumb never to use any topical application longer than five days. This is particularly true with antibiotic preparations. We have seen severe local toxic reactions with penicillin and, especially, streptomycin, and in view of this we are very careful in their use.

Dibromosalicylaldehyde (dalyde®) is effective against Gram-negative organisms and fungi. A wick saturated with a 2% solution of the medication is introduced into the external ear canal and permitted to remain for 24 to 72 hours. Depending upon the clinical picture, it may be necessary to repeat the procedure. Following this procedure the canal is treated with insufflations of dibromosalicylaldehyde powder at daily or weekly intervals, depending upon the local condition.

Nitrofurazone (furacin®) is said to be effective against the Gram-positive cocci and diphtheroids. The treatment is somewhat similar to that with dibromosalicylaldehyde, except that it is necessary to moisten the wick four or five times daily.

Coparaffinite (iso-par ointment®) is an effective fungicide and bactericide. It also has a local anesthetic effect, stimulates rapid healing, and is nontoxic. After the canal is cleansed, a narrow wick dipped in the ointment is inserted into the meatus and left in place for two days. This is repeated every two or three days until the ear is dry.

In the treatment of otomycosis useful drugs are powdered sulfanilamide, 2% solution of salicylic acid in alcohol, metacresylacetate (cresatin®), thymol (1% or 2% solutions), and a 1% solution of thymol in metacresylacetate. In all cases the treatment consists initially in gentle cleansing of the auditory canal. Day [16] feels that in otomycosis, if the ear canal can be kept dry for a few days, the fungus will usually disappear. He states that clinically most cases of fungus infection "seem to run in a three-day cycle, in which the ear may stay clean for two or three days and about the fourth day show recurrence." Therefore treatment should be carried out daily for at least a week. In mild conditions, the application of powdered sulfanilamide blown into the ear with a powder blower has proved to be quite effective in numerous cases. When a 2% solution of salicylic acid in alcohol is used, the liquid should be warmed to body temperature, and 5 to 6 drops should be instilled into the affected ear canal and allowed to remain in place for several minutes. This procedure is repeated twice daily until the condition subsides.

Metacresylacetate is fungicidal and bactericidal, and has a local analgesic effect. In most patients it can be used full strength, but in blonds or persons whose skin seems particularly sensitive it is better to use a 50% solution. Thymol can be used as either a 1% or a 2% solution. It has similar properties to metacresylacetate but locally it may be very irritating. A mixture of 1% thymol in metacresylacetate is better. All these solutions are applied with a saturated wick, which can be removed in 24 to 48 hours, depending upon the clinical response, and followed by the instillation of 5 drops of the solution into the involved canal twice daily for several days.

In the treatment of acute eczematous dermatitis involving the ear canals, careful cleansing, the application of a soothing ointment, and the avoidance of any mechanical intervention such as scratching, give the best results. Any secondary infection should be treated with the appropriate systemic antibiotic. Fabricant [1b] states that when the Streptococcus organism can be found on bacterial examination a 5% solution of ammoniated mercury produces rapid healing.

In the chronic stage of the eczematous conditions it is important to remove the scales from the cutaneous surface of the canal and to try to reestablish normal skin physiology. The latter is a very difficult, if not in most cases an impossible, procedure because of the underlying metabolic and emotional factors in many of these cases.

16. Day, K.: Personal communication to the authors.

In the treatment of otitis externa in general there are many familiar medications which have been tried over the years with various degrees of success or failure. These are such preparations as methylrosaniline chloride (gentian violet), merbromin (mercurochrome®), acriflavine, ammoniated mercury or resorcin ointments, boric and iodine powder, zinc peroxide, silver salts, alcohol, copper sulfate 10%, and many others. Even today these preparations are used extensively, with varying results, but fortunately the general tendency is to use more rational therapy.

SUMMARY

It is quite apparent that there is still much to be learned about the etiological agents, the underlying physiopathology, and the treatment of otitis externa. In the last 10 years great strides have been made towards a clearer understanding of the over-all problems. The recognition of the initial upset in the physiology of the skin resulting in a loss of the normal "acid mantle," which is a resisting mechanism, is a fundamental principle. This shows that thinking is at least being directed towards the basic factors.

The clarification of the bacteria vs. fungus question and the importance of the proper choice of therapy are stressed. The newer medications available and the various types of the disease are discussed.

In bacterial cases the question of sensitivity of the organisms to the antibiotic used is of extreme importance because of the high percentage of resistant strains today.

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SWEAT GLAND CARCINOMA NEAR EXTERNAL EAR

Difficulty in Diagnosis by Incisional Biopsy

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IT MUST be presumed that as an otolaryngologist I do not see sweat gland carcinoma, since persons with such lesions usually consult the dermatologist or oncologist. Within a period of less than one year, however, three cases of sweat gland carcinoma came under my observation. In all these cases early diagnosis by incisional biopsies did not establish the diagnosis of sweat gland carcinoma. Only after excision or repeated biopsies was this diagnosis made.

In one case, the diagnosis made from one biopsy was basal-cell carcinoma. This tumor was conservatively excised, but there was recurrence. Another biopsy specimen was taken, and squamous-cell carcinoma was reported. When the patient was being operated on, it was found that there was a large tumor invading the parotid gland and the bone forming the tympanic plate. A wide excision was carried out. From the histologic study of the entire specimen the diagnosis of sweat gland carcinoma was made. The reason for the previous error becomes apparent when one carefully examines the specimen. There are areas which look like basal-cell carcinoma, others like squamous-cell carcinoma, and still others that are adenocarcinoma. A small incisional biopsy may show only one of these.

In the second case there were many basal-cell carcinomata over the face and one in front of the ear. The last carcinoma did not respond to irradiation. After several repeated biopsies, the characteristics of the sweat gland carcinoma became apparent.

In the third case, a small nodular lesion in front of the ear was diagnosed from an incisional biopsy as a basosquamous carcinoma. The recommendation was external irradiation. However, because of my experience with the first two cases and the similar location of the growth, I insisted on excision. Here again the growth was found to be a sweat gland carcinoma.

With a preoperative diagnosis of sweat gland carcinoma, one would be unlikely to recommend irradiation except in special circumstances. Unlike the basal-cell or squamous-cell forms, such a carcinoma is not often successfully treated by irradiation. The growth may be slowed down, but the tumor may continue to grow, and I have found it to be very invasive. In my observations I have seen no

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Fig. 1.—Sweat gland carcinoma in front of ear; squamous-cell carcinoma of nose; multiple basal-cell carcinomata of face.

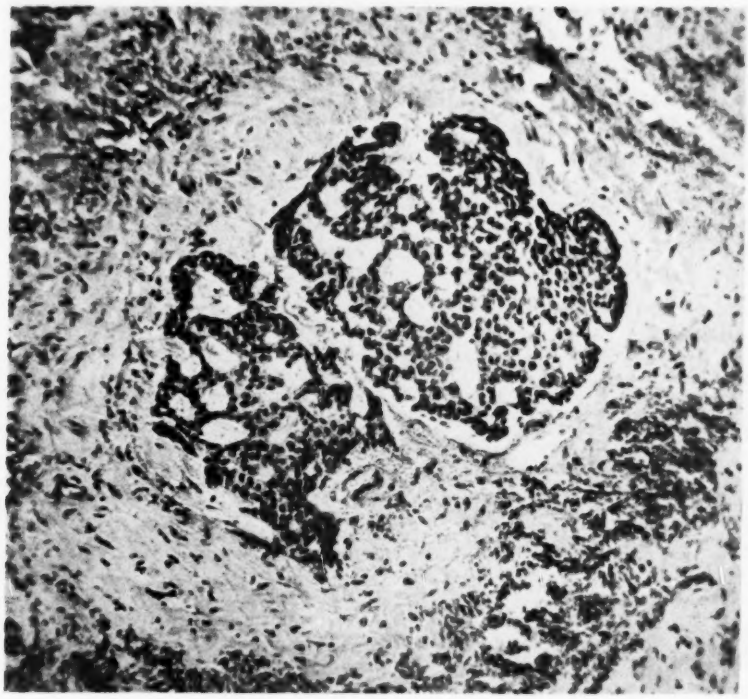

Fig. 2.—Low-power view of basal-cell carcinoma. Biopsy specimen obtained by incision from what later proved to be a sweat gland carcinoma.

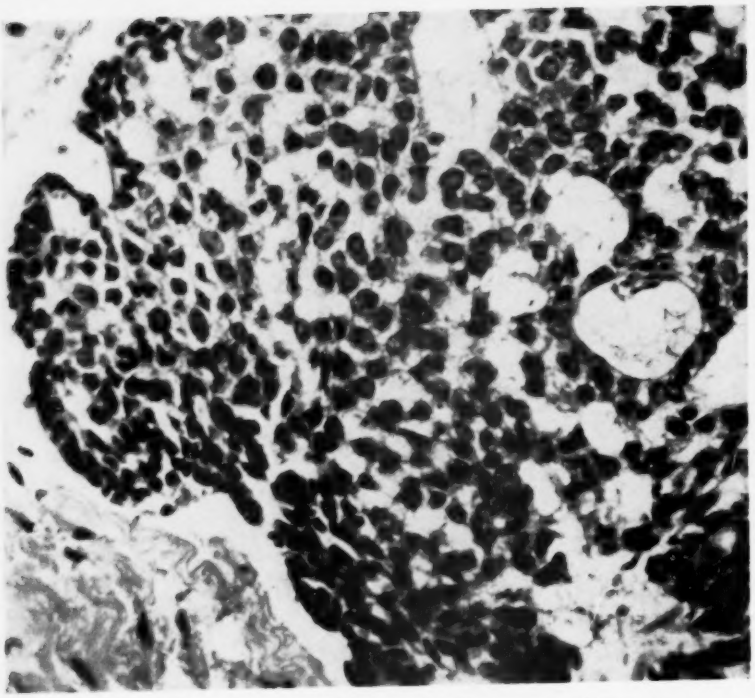

Fig. 3.—High-power view of section of lesion shown in Figure 2.

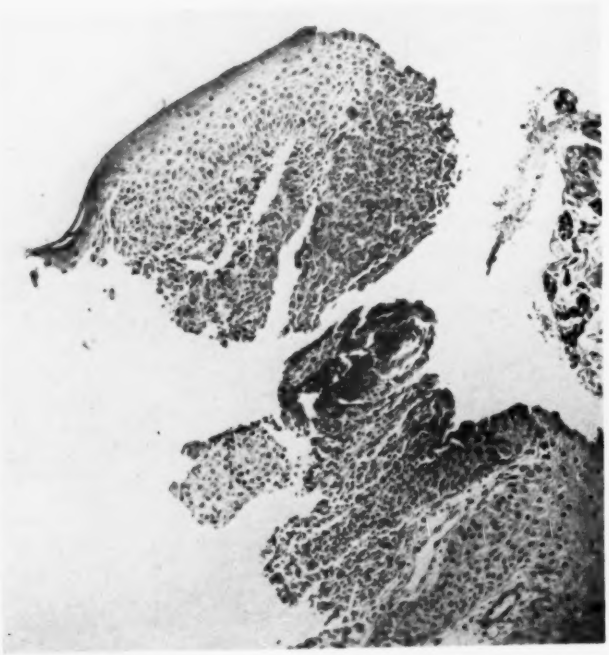

Fig. 4.—Low-power view of squamous-cell carcinoma which appeared in one area of the specimen of a sweat gland carcinoma.

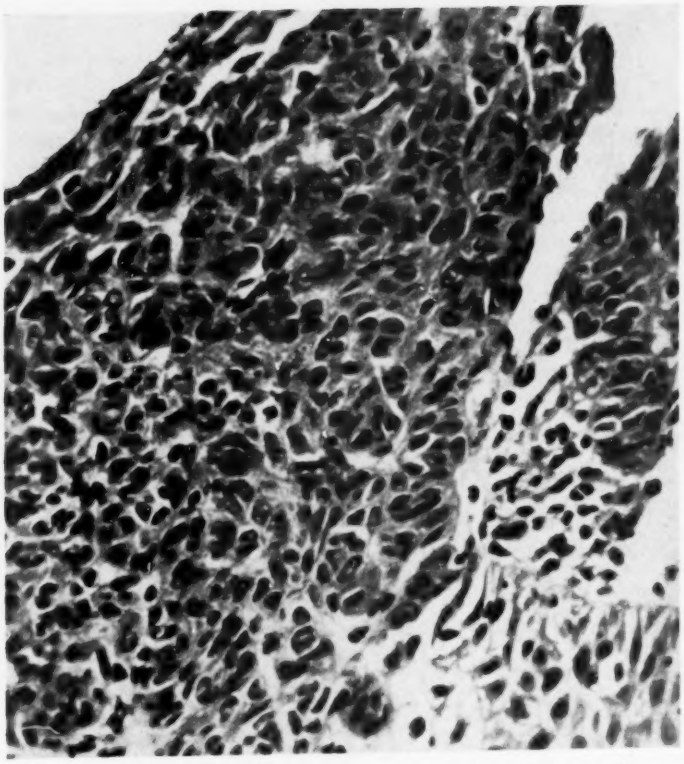

Fig. 5.—High-power view of section of lesion shown in Figure 4.

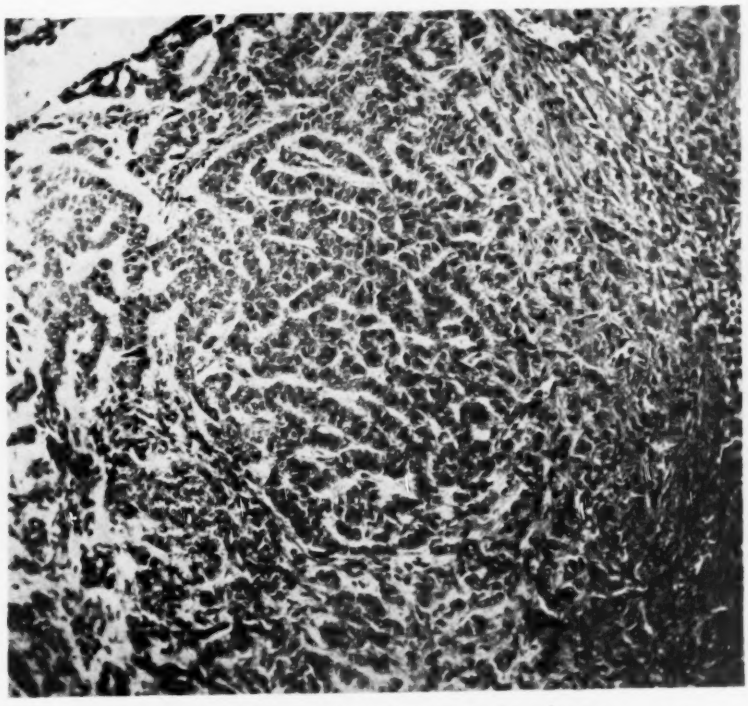

Fig. 6.—Low-power view of sweat gland carcinoma.

metastasis to lymph nodes, but the possibility of metastasis exists, as reported by Stout.[1] Because of the invasiveness, the possibility of metastasis, and the resistance to radiation, these lesions should be excised. As my experience with these three cases shows, diagnosis from incisional biopsies may not be accurate. For this reason, carcinomata around the ear should be excised rather than treated by irradiation. If careful records are kept and the diagnoses made by incisional biop-

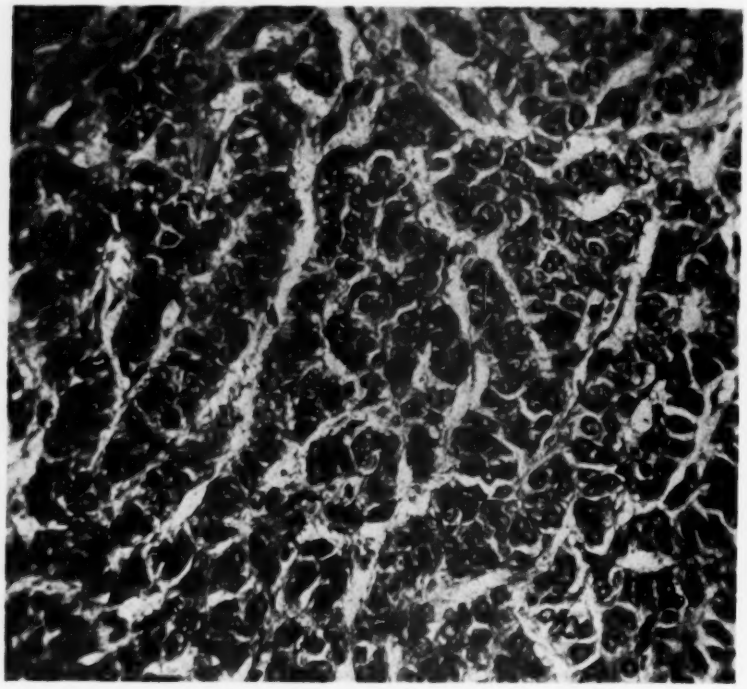

Fig. 7.—High-power view of section of lesion shown in Figure 6.

sies are compared to the final diagnoses after excision, we will in time learn the frequency with which this lesion occurs.

SUMMARY

Three cases of sweat gland carcinoma near the ear are presented. In each case, specimens obtained by incisional biopsy were not representative of the tumor, and therefore incorrect diagnoses were made. It is recommended that, regardless of the biopsy report, lesions in this location be excised rather than irradiated.

1. Stout, A. P., and Cooley, S. G. E.: Carcinoma of Sweat Glands, Cancer **4**:521-536 (May) 1951.

CARCINOMA OF THE LARYNX WITH DISTANT LYMPHATIC METASTASES

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IN A CENTER where a large number of malignant head and neck tumors are seen, the appearance of patients with unusual sites of metastases deserves comment. At the Veterans Hospital, Bronx, New York, approximately 180 head and neck tumors are seen a year. Two patients with laryngeal carcinoma displayed unusual metastatic foci to the axilla and the skin of the chest wall, and constitute the subject of this report.

The literature is conspicuously free of reports of distant spread of laryngeal tumors. In a book published by Willis [1] in 1934, in collaboration with Churchill, no mention is made of distant spread of laryngeal tumors. In a more recent publication by Willis [2] in 1948, there is again no record of distant metastatic deposits from laryngeal carcinoma. Thomson and Colledge [3] in their 1930 text report the case of one patient with a laryngeal cancer that metastasized to the humerus. They quote A. Brounder, who recorded spread to the liver, stomach, kidney, and lung. Taylor and Nathanson [4] make brief comment on the topic of laryngeal cancer with metastases by stating that "in addition to cervical node metastases, there were instances of axillary and mediastinal involvement, thyroid, and five cases with lung metastases."

REPORT OF CASES

CASE 1.—A 34-year-old white man was admitted on Feb. 23, 1950, with painful masses in the right side of the neck, of about five weeks' duration. One node removed by his private physician showed metastatic squamous cell carcinoma. Examination revealed a large firm, fixed mass, 8 cm. in diameter, in the left posterior cervical triangle. Indirect laryngoscopic examination revealed the presence of a large polypoid neoplasm arising from the left ventricle. The left cord was partially fixed. A biopsy from this mass showed epidermoid carcinoma (Fig. 1).

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1. Willis, R. A.: The Spread of Tumors in the Human Body, London, J. & A. Churchill, Ltd., 1934.

2. Willis, R. A.: Pathology of Tumours, St. Louis, C. V. Mosby Company, 1948.

3. Thomson, St. C., and Colledge, L.: Cancer of the Larynx, London, Rontledge & Kegan Paul, Ltd., 1930.

4. Taylor, G. W., and Nathanson, I. T.: Lymph Node Metastases: Incidence and Surgical Treatment in Neoplastic Disease, London, Oxford University Press, 1942.

Fig. 1 (Case 1).—Photomicrograph of a biopsy specimen taken from the original lesion in the left false cord. The histological picture shows a typical epidermoid carcinoma, moderately differentiated, with infiltration into deep muscle. Bizarre and giant nuclei are visible among the numerous mitotic figures.

Fig. 2 (Case 1).—Patient as he appeared after tracheotomy and a left radical neck dissection, and after the primary tumor, which apparently arose in the left ventricle, had received an x-ray dose of 5,000 r delivered in 31 days.

Fig. 3 (Case 1).—This demonstrates the large, fixed, hard mass in the left axilla. The overlying skin is represented as shiny, tense, and red. One area has broken down and presents itself as a superficial ulcer whose edges are elevated and rolled. The entire area covers approximately 10 cm.

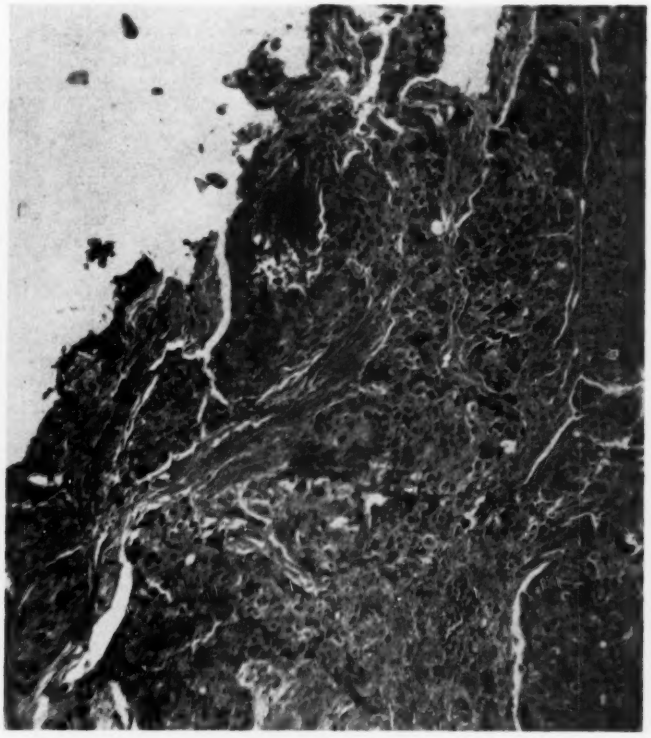

Fig. 4 (Case 1).—Photomicrograph of a biopsy specimen taken from the mass in the left axilla. A medium-power histological study reveals again a typical epidermoid carcinoma. There are numerous irregular, giant nuclei, which may represent an initial reaction to radiation effect. This biopsy was taken early in the course of x-ray treatment given to this mass. Also, there is an increased amount of keratinization, which similarly may represent radiation effect.

Fig. 5 (Case 1).—The mass in the left axilla soon after delivery of an x-ray dose of 6,000 r (air) through a grid. A reasonable semblance of a grid pattern has been created. The skin directly overlying the mass shows a second-degree reaction with skin denudation. The mass has not been influenced. Treatment was abandoned at this time.

Fig. 6 (Case 2).—A medium-power photomicrograph of a biopsy specimen from the large tumor mass overlying the right true cord, showing squamous cell epithelioma.

Fig. 7 (Case 2).—The chain of nodules along the left anterior chest wall is clearly visible. These nodules appeared after malignant infiltration appeared about the tracheotomy stoma. This area, upon biopsy, yielded positive evidence of malignant spread. Biopsy was done on the nodule nearest the axilla (Fig. 8).

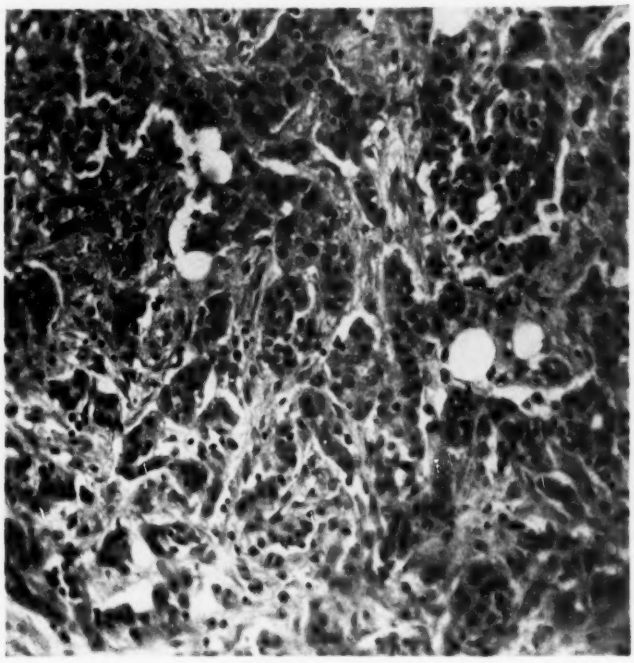

Fig. 8 (Case 2).—A photomicrograph of the nodule nearest the axilla seen in Figure 7. This study shows a typical squamous cell epithelioma with moderately differentiated cells.

Soon after admission, a left radical neck dissection was done. All lymph channels from the superior jugular group down to the supraclavicular area were found infiltrated with cancer. The thoracic duct, which was similarly involved, was ligated. The poor condition of the patient halted the contemplated procedure of a laryngectomy in continuity. Instead, a tracheotomy was done (Fig. 2).

The primary laryngeal tumor was treated with roentgen rays. A tumor dose of 5,000 r was delivered over an elapsed time of 31 days, using 220 kv., a Thoraeus filter (half-value layer 2 mm. Cu), and 50-cm. distance through two opposing portals of 8-cm. diameter. This cycle was completed on May 11, 1950. Three weeks later, a biopsy of the local area taken through a laryngoscope showed no active tumor. Further evaluation, five months later, revealed edema of the epiglottis, arytenoids, and ventricular bands. The glottic chink was almost obliterated. A right radical neck dissection was performed because of the presence of nodes.

In October, 1951, several subcutaneous nodules appeared on both sides of the neck, as well as a large nodular fixed mass in the left axilla (Fig. 3). This proved to be squamous cell

Fig. 9 (Case 2).—X-ray photograph of chest showed widening of superior mediastinum due to tumor.

carcinoma (Fig. 4). An attempt was made to treat the lesion through a grid, but when no response was elicited with a dose of 6,000 r (air), it was abandoned (Fig. 5).

Histologically, the primary tumor is a fairly well differentiated epidermoid carcinoma, which is seen infiltrating deeply. Much of this pattern is retained in the metastatic focus in the axilla, modified somewhat by a tendency toward increased keratinization and with some bizarre giant nuclei.

Case 2.—A 61-year-old white man was admitted on March 16, 1950, because of hoarseness of three years' duration. At the time of admission a tracheotomy was deemed a necessity. Examination disclosed a grayish fungating mass covering both ventricular bands. The right cord was totally fixed by this mass. No cervical nodes were felt. A biopsy of the mass from the right cord (Fig. 6) showed an epidermoid cancer, infiltrating deep into muscle bundles. One month later, a complete laryngectomy was done. Although both cords were found infiltrated with tumor, little extension superiorly or inferiorly was observed.

Five months later irregular granulations appeared about the stoma. One of these, upon biopsy, showed epidermoid carcinoma. The entire tracheotomy area was given x-ray therapy

using a quality ray of 2 mm. Cu, half-value layer. A tumor dose of 4,500 r delivered over 31 elapsed days failed to induce any regression. Thereafter, a chain of subcutaneous nodules appeared along the left side of the chest, as illustrated in Figure 7. A biopsy of one nodule (Fig. 8) showed a collection of islands and strands of epidermoid cancer in a moderately dense fibrous stroma.

Respiratory difficulty developed. This was explained by examination of the trachea, which showed infiltration as far down as the carina. This area was irradiated; a dose of 3,400 r was delivered in 40 days, with use of the same quality ray as above. The patient obtained minimal benefit. In addition, an x-ray photograph of the chest (Fig. 9) showed a widened superior mediastinum due to the presence of nodes. The patient eventually succumbed as a result of acute respiratory obstruction.

SUMMARY

Two cases of carcinoma of the larynx are presented, in which distant spread occurred along the lymphatics to the chest wall in one instance and to the axillary chain in the second. The rarity of this spread prompted the report.

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CHEMICAL BURNS AND STRICTURES OF THE ESOPHAGUS

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AS ALONZO TAYLOR once aptly said, "There are in the body duplicate plants or factories for chemical digestion, but only one muscular tube for the transport of material between the plants. Naturally, when function in this tube breaks down, or when the current is slowed or reversed, there is trouble and the owner of the tube is promptly apprised that something unpleasant and even dangerous is going on."

This classic statement quoted by Walter C. Alvarez[1] applies as cogently to conditions in the esophagus as to conditions elsewhere in the alimentary canal. In no other region does obstruction manifest itself more promptly or more distressingly to the patient. Such obstruction is commonly caused by a burn following the ingestion of a corrosive chemical. The current in the esophagus is interrupted primarily by the acute inflammatory reaction and swelling in the tissues. Subsequently, the potential development of a cicatricial stenosis of the esophagus exists as a constant menace for the remainder of the patient's life.

INCIDENCE AND ETIOLOGY

During the 15-year period from 1936 to 1950 inclusive, 47 patients were admitted to St. Luke's and Roosevelt hospitals in New York City with chemical burns of the esophagus, either in the acute stage of esophagitis, or with cicatricial strictures resulting from the ingestion of corrosives.

The chemicals responsible for these lesions of the esophagus are shown in Table 1.

The commonest cause of corrosive burns of the esophagus is accidental ingestion of commercial lye, which contains sodium hydroxide in a concentration of 95%. Many of the cleansing agents and washing powders in general use contain this caustic alkali in concentrations varying from 8% to 50% and are capable of destruction of the esophageal mucosa. The preponderance of lye as the etiological agent is common knowledge and is supported by all statistical studies of esophageal burns. Its importance is such that a survey of the literature on the subject reveals more scientific articles dealing exclusively with lye as the problem than appearing under any more generic title.

During the 15-year period covered in this study, the total number of admissions to the two hospitals was 247,748. With 22 cases of lye poisoning with esophageal

Presented as a candidate's thesis to the American Broncho-Esophagological Association.

1. Alvarez, W. C.: An Introduction to Gastro-Enterology, Ed. 4, New York, Paul B. Hoeber, Inc., 1948, p. 137.

signs observed during this time, a rate of 8.9 per 100,000 admissions is found to be present. Brown and Kiser [2] reported in 1942, after a nationwide survey, an average of 14.5 cases of lye poisoning per 100,000 admissions in 181 hospitals in the United States for the years 1914 to 1939 inclusive. These cases were not, however, restricted to those showing evidences of some esophageal damage. Their analysis indicated the higher incidence of lye accidents in the southern states, which fact has been noted by others,[3] and a lower rate in the New England, Pacific, and northern states. An adjusted lye-poisoning rate which they determined for the Middle Atlantic States was 11.6 per 100,000 hospital admissions.

Accidental lye poisoning continues to be a problem of considerable importance despite a federal law enacted in 1927 requiring that all commercial products containing lye and other caustic chemicals be plainly labeled as poison. This legislation culminated several years of intensive efforts by Chevalier Jackson [4] and his co-workers [5] and Clerf,[6] and actually did succeed in reducing the incidence of lye strictures in Pennsylvania, Florida, and Colorado by 50% during the year 1934

TABLE 1.—*Chemicals Responsible for Burns of the Esophagus*

Cause	Total Cases	Number of Strictures
Lye	22	12
Ammonia	8	3
Iodine	7	0
Saponated cresol solution (lysol®)	3	1
Phenol	2	1
Mercury bichloride	2	0
Hydrochloric acid	1	1
Sulfuric acid	1	0
Sodium hypochlorite solution (clorox,® a halogen)	1	0
Totals	47	18

as compared with that during the year 1926.[7] Increasing education of the public concerning the harmful nature of these substances is still urgently needed.

While ingestion of lye accounts for a large proportion of chemical burns of the esophagus (47% in this small series), it is responsible for a disproportionately large share of those cases in which stricture develops (12 cases, or 66%, in this series). This proclivity of burns caused by caustic alkali to cause development of

2. Brown, H. W., and Kiser, G.: Epidemiology of Lye Poisoning in the United States, Am. J. Pub. Health **32**:822-830 (Aug.) 1942.

3. (*a*) Blassingame, C. D.; McArthur, R. H., and Atkinson, R. H.: Ingestion of Lye: A Serious Problem, South. Surgeon **13**:626-634 (Sept.) 1947. (*b*) Hanckel, R. W.: Lye Burns of the Esophagus, Ann. Otol. Rhin. & Laryng. **60**:22-38 (March) 1951.

4. Jackson, C.: Esophogeal Stenosis Following the Swallowing of Caustic Alkalies, J. A. M. A. **77**:22 (July 2) 1921.

5. Jackson, C.; Lewis, F. O., and Mackenzie, G. W.: Report of the Committee on Lye Legislation, J. A. M. A. **79**:1843 (Nov. 25) 1922.

6. Clerf, L. H.: Cicatricial Stenosis of the Esophagus Caused by Commercial Lye Preparations, J. A. M. A. **80**:1600-1603 (June 2) 1923.

7. Taylor, H. M.: A Preliminary Survey of the Effect Which Lye Legislation Has Had on the Incidence of Esophageal Stricture, Ann. Otol. Rhin. & Laryng. **44**:1157-1158 (Dec.) 1935.

cicatricial stenosis of the esophagus is well known. Guisez [8] reported that the ingestion of caustic alkali was responsible for stricture of the esophagus in 169 out of 185 patients. Vinson [9] found that 102 of 186 esophageal strictures seen at the Mayo Clinic were due to the ingestion of lye. Kernodle [10] and co-workers from the Duke University Hospital in 1948 reported strictures in 102 of 136 children with lye poisoning.

The number of esophageal strictures following the ingestion of corrosive acids is small in contrast to that resulting from contact with caustic alkali. In acid burns death may result from toxic absorption from the stomach, but those patients who recover not infrequently escape stricture formation. This has been noted as particularly true of phenol. Hodge and Sharfe [11] reported 30 cases of attempted suicide with this drug in which no stricture formed. On the other hand, one of the most intractable cases in the present series was that of a white man 40 years of age who drank phenol by mistake after having consumed a large quantity of whiskey. A tight cylindrical stricture developed involving the lower third of the esophagus. This obstruction necessitated a gastrostomy and retrograde bouginage for many months in another hospital. Fifteen years later, the esophagus became obstructed

TABLE 2.—*Age Incidence in Chemical Burns of the Esophagus*

Age	Lye	Other Chemicals	Total
1- 5	13	1	14
5-10	3	..	3
10-15	1	..	1
15-20	..	3	3
Over 20	5	21	26
Totals	22	25	47

with a meat bolus, which was removed through an esophagoscope. The stricture was subsequently dilated by esophagoscopic bouginage every two or three weeks for two years. Two years later, recurrence of the acute obstruction necessitated esophagoscopy and further dilations.

AGE INCIDENCE

The majority of lye burns occur in young children, and conversely, the majority of burns in young children are due to lye. All chemical burns of the esophagus in the 18 patients under 15 years of age were caused by lye, except one, which was due to sodium hypochlorite solution (clorax®), and all were accidental. In 13 of the lye-burn cases (59.1%) the accident occurred in children between the ages of 1 and 5. No patients were under 1 year of age. Kernodle,[10] in 136 child patients found an incidence of 82% in the 1- to 5-year-old group and remarked on the rarity

8. Guisez, J.: Pathology and Forms of Inflammatory Stenosis of the Esophagus, Gaz. d. Hôp., Paris **95**: 295-300 (March 7) 1922.

9. Vinson, P. P.: Cicatricial (Benign) Stricture of the Esophagus: Tabulated Report of 186 Cases, Ann. Otol. Rhin. & Laryng. **36**:40-56 (March) 1927.

10. Kernodle, G. W.; Taylor, G., and Davison, W. C.: Lye Poisoning in Children, Am. J. Dis. Child. **75**:135-142 (Feb.) 1948.

11. Hodge, G. E., and Scharfe, E. E.: Stricture of the Esophagus, Canad. M. A. J. **37**:541-547 (Dec.) 1937.

of the lesion under the age of 1 year; he had had only three cases (2%) in this age group. McHenry and Clay [12] in 52 patients with benign caustic strictures had none under 1 year of age, and half were under 3 years of age. In the opinion of these authors the burden of prevention of such accidents falls on the parents or guardians.

Chemical burns caused by agents other than lye are more common in adults. In the present series, non-lye burns occurred solely in patients over 15 years of age, with the exception of a 2-year-old girl who had swallowed sodium hypochlorite solution. Analysis of the manner in which the corrosive poison was ingested revealed three types of cases in this group. Some were completely accidental in that the caustic substances were swallowed by mistaking them for a medicament, the so-called medicine-cabinet accidents. Others were the result of attempted suicide by purposeful ingestion. Still others occurred from drinking the corrosive chemicals in error for alcohol, usually after considerable alcohol had already been consumed. In a

TABLE 3.—*Sex Distribution in Chemical Burns of the Esophagus*

Age at Time of Accident	Male	Female	Total
Under 15	11	6	17
Over 15	13	17	30
Totals	24	23	47

TABLE 4.—*Site of Strictures in Chemical Burns of the Esophagus*

Upper third	4
Middle third	5
Lower third	2
Upper and middle thirds	3
Upper and lower thirds	1
Middle and lower thirds	2
Multiple—upper, middle, and lower thirds	1
Total	18

densely populated urban region, the relative frequency of these nonalkaline chemical burns in adults is at variance with statistics from rural areas, where lye burns in children are in the majority.

SEX DISTRIBUTION

The occurrence of chemical burns of the esophagus is about equal in the two sexes. The greater number of these accidents in males under 15 years of age may be due to the fact that boys are more active and mischievous than girls and more apt to encounter the contaminant. This was Uhde's [13] explanation in his report, in which this sex discrepancy was much greater.

The simple accident rate in the adult group was more evenly distributed between the sexes; but the greater number of suicidal attempts among the females by

12. McHenry, L. C., and Clay, R. A.: Benign Esophageal Strictures, J. Oklahoma M. A. **38**:469-474 (Nov.) 1945.

13. Uhde, G. I.: Chemical Burns of the Esophagus, Ann. Otol. Rhin. & Laryng. **55**:795-820 (Dec.) 1946.

swallowing corrosive poisons more than equaled the "alcohol accidents" of the males. This phenomenon was observed also by Kiviranta [14] among 379 patients in the Scandinavian countries.

PATHOLOGY

According to Jackson,[15] the levels most often and severely affected are, in order of frequency, first, the crossing of the left bronchus; second, the region of the cricopharyngeus, and, third, the hiatal level. However, Martin and Arena [16] and Kernodle [17] found in children that strictures were most frequent in the upper third because in them the esophageal opening is small. Multiple strictures are said to occur in 30% to 40% of cases. There were seven multiple cases (39%) among those reported here. All the cases in which the upper esophageal segment was involved, either alone or with other stricture levels, with one exception, were in children whose accident took place before the age of 10 years.

In the upper esophagus many of the strictures were eccentric, but in the midthoracic region they were more often of the short annular type. Stenosis of the lower segment is more liable to be of the tubular variety and is often severe. Abel [17] believes that in adults a quantity of fluid normally passes directly to the cardiac sphincter, where it may be held for a time by reflex spasm, thus permitting a deeper burn. One of our most discouraging cases was that of a white woman 30 years of age with this type of tubular stricture following accidental ingestion of lye solution three months previously. A gastrostomy was performed, but no bougie larger than a No. 22F. could be pulled through by the retrograde method. Her weight had dropped from 150 lb. (68 kg.) to 80 lb. (36.3 kg.) before admission. Despite every therapeutic effort to overcome the advanced degree of starvation, death supervened in six weeks from marasmus and bronchopneumonia. The autopsy revealed a tight rigid cylindrical stenosis 12 cm. in length extending from the midesophagus to the cardia.

Although the condition occurs rarely, complete cicatricial atresia was not encountered in any of the patients.

The severity of the anatomic changes depends on the type, concentration, and amount of the corrosive substance which comes in contact with the wall of the esophagus. Belinoff [18] divided acute corrosive esophagitis into three groups—the mild cases, the moderately severe cases, and the severe cases. These might be classified as first-, second-, and third-degree burns, respectively (Table 5).

First-degree burns cause superficial inflammation and edema involving only the mucous membrane and submucous layer. They will heal without stricture formation or at most with only a small eccentric membranous obstruction.

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14. Kiviranta, U. K.: Corrosion of Esophagus and Stomach: Their Sequelae and Treatment, Acta. oto-laryng., Supp. 81, pp. 1-128, 1949.

15. Jackson, C., and Jackson, C. L.: Bronchoesophagology, Philadelphia, W. B. Saunders Company, 1950, p. 306.

16. Martin, J. M., and Arena, J. M.: Lye Poisoning and Stricture of the Esophagus, South. M. J. **32**:286-290 (March) 1939.

17. Abel, A. L.: Oesophageal Obstruction: Its Pathology, Diagnosis and Treatment, London, Oxford University Press, 1929, p. 150.

18. Belinoff, S.: Treatment of Corrosive Esophagitis, in Terracol, J., and others: Les maladies de l'œsophage, Paris, Masson & Cie, 1938.

In second-degree burns the coagulation necrosis of the tissues extends more deeply to involve the muscular layers. The initial stage of hyperemia and edema soon passes into ulceration. Sloughing out of necrotic membrane leaves the deeper layers exposed. About the second week extensive granulations develop with the formation of fibrous tissue. Increasing deposition of collagen into this tissue occurs early and contraction of the fibrils begins. It is the latter pathological event which, unless it is prevented or controlled, ultimately narrows the esophageal lumen with the formation of a cicatricial stricture.

Third-degree burns cause necrosis of all the layers of the esophageal wall, with periesophagitis and involvement of the mediastinal tissues as well. Perforation of the esophageal wall is a real danger. As a rule, patients with severe burns of this type quickly die from general intoxication, chemical mediastinitis, and heart failure.

Stumboff,[19] reporting on chemical burns of the oral cavity and esophagus in Bulgaria, found the proportions in 603 acute cases to be 10%, 63%, and 27% of first-, second, and third-degree burns, respectively.

TABLE 5.—*Degree of Burn in Acute Cases of Chemical Burns of Esophagus*

Degree	Number	Percentage
1st	9	30%
2d	17	57%
3d	4	13%
Totals	30	100%

The character of the tissue reaction in the esophageal wall varies somewhat according to the type of corrosive substance ingested. The caustic alkalis of the sodium hydroxide and ammonia class cause marked edema, and ulceration, and a necrosis of the tissues which imparts a soft white gelatinous appearance to them. According to Delph [20] this severe destructive action of the alkalis is due to their strongly hygroscopic properties, their saponifying action on the lipids, and their solvent action on the proteins. It is this category of chemicals which causes most of the strictures. The corrosive acids on contact with the mucous membranes produce a dry escharotic lesion of a grayish-white or sometimes nearly black color, with less edema. The nonmetallic irritants, such as iodine and the halogen group, produce in the mucosa considerable irritation of a diffuse erythematous nature, but no deep burns and little tendency toward contracture. Of seven patients who swallowed tincture of iodine (six in suicide attempts), one died and one had to be transferred elsewhere because of a violent acute psychosis and was not followed. None of the other five patients reported back with signs of esophageal sequelae although they had varying degrees of acute symptoms of esophagitis and gastritis while under observation.

19. Stumboff, A. V.: Chemical Burns of the Oral Cavity and Esophagus, Arch. Otolaryng. **52**:419-426 (Sept.) 1950.

20. Delph, J. F.: Chemical Burns of the Oral Cavity and Esophagus, S. Clin. North America **17**:585-592 (April) 1937.

SYMPTOMATOLOGY

In acute burns of the esophagus, the outstanding symptoms are pain low in the throat and substernal region, dysphagia, and fever. According to Vinson,[21] the mouth and throat are always involved in these cases and cause the major portion of the primary discomfort. Hoarseness occurs when burns are present in the region of the larynx. Unless rather large amounts of the corrosive are ingested, the systemic symptoms are not marked. There may be acidosis from dehydration and acute starvation. Gastritis and general toxemia from absorption of the ingested poison occur more commonly with corrosive acids than with alkalis, probably because of some neutralization of the latter by the acid secretion of the stomach. Shock is present only in severe cases.

When the acute inflammatory reaction abates after one or two weeks, the acute symptoms subside and the patient is able to swallow liquids and soft food. After a latent interval of a few weeks to two months, contraction of the scar tissue in the esophageal wall causes increasing dysphagia and finally regurgitation even of liquids. Progressive loss of weight from starvation ensues. If left to itself, a stricture of the esophagus never regresses or shows any tendency to spontaneous cure. The patient may experience no symptoms for many years, only to have dysphagia slowly establish itself, or an acute obstruction from a food bolus may suddenly make manifest the existence of a stricture resulting from an accident long since forgotten.

Of the 18 patients with stenosis of the esophagus, 8 had impaction of a food bolus when first seen. Four others had lodgement of a foreign body at some time while under observation, usually after a lapse in treatment. A 63-year-old man was seen for the first time with a meat bolus impacted at a stricture from a lye burn in the upper esophagus. The accident occurred when he was 10 years old. Until shortly before this acute obstruction he had had no symptoms of a stenosis.

A woman of 36 swallowed lye at the age of 5, and a man of 43 swallowed lye at the age of 3. Since the immediate period of the accident neither patient had had any symptoms or treatment whatsoever until a sudden acute impaction brought them to the hospital. These cases illustrate symptom-free intervals of 31 years and 40 years, respectively. It is important to remember that once the esophagus has been burned, stricture formation may develop at any time in the life of the patient.

DIAGNOSIS

The diagnosis in most instances can be determined by the history alone. Ingestion of a corrosive substance followed by difficulty in swallowing is indicative of cicatricial stenosis of the esophagus.

Roentgenoscopic examination reveals an obstruction only, and does not define its character or etiology. Webb and Woolsey [22] found that localizing the stricture may be misleading unless a thick barium sulfate mixture is employed. The delay obtained in the passage of a thick preparation makes visualization easier. This is

21. Vinson, P. P.: The Diagnosis and Treatment of Diseases of the Esophagus, Springfield, Ill., Charles C Thomas Publisher, 1940, p. 61.

22. Webb, B., and Woolsey, D. S.: Lye Burns of the Esophagus, J. A. M. A. **141**:384-386 (Oct. 8) 1949.

important in examining the cervical esophagus, especially in small children. The value of x-ray studies in the acute or subacute stages is doubtful. Edema of the esophageal wall narrows the lumen, and a negative report does not preclude the formation of a stricture afterward.

Esophagoscopy is the most reliable method of localizing strictures and determining whether or not the scar tissue entirely surrounds the lumen. Its use is limited in multiple strictures, in that only the upper one can be visualized. The procedure should be avoided during the acute or subacute stage of esophagitis because of the danger of further trauma to the esophageal walls and possible perforation.

COMPLICATIONS

The complications of acute corrosive esophagitis are numerous and vary from minor skin burns of the face to massive chemical mediastinitis and death. To a large extent they depend upon the type and amount of the harmful substance ingested. Caustic burns of the mouth and pharynx are not included in the following table as they are almost a constant accompaniment of esophageal burns.

TABLE 6.—*Complications in 30 Cases of Acute Corrosive Esophagitis*

Complication	Number of Cases	Causative Agent
Edema and ulceration of larynx	6	Ammonia 3; lye 2; iodine 1
Acute gastritis	8	Ammonia 3; iodine 2; lye 1; mercury bichloride 1; phenol 1
Acute nephritis	1	Mercury bichloride
Burns of skin	6	Sulfuric acid 1; lye 3; ammonia 1; phenol 1
Acute psychosis (preceded ingestion)	3	Iodine; lye; mercury bichloride
Died of shock or pulmonary edema within 24 hours	3	Iodine; sulfuric acid; saponated cresol solution

In the presence of chronic esophageal stenosis, the urgent symptoms of obstruction and starvation overshadow all other sequelae. Pulmonary complications, for instance, unless severe, are often overlooked or misinterpreted.

> Where the greater malady is fix'd,
> The lesser is scarce felt.
> —Shakespeare, *King Lear*, Act III, Sc. 4, l. 8

Jackson and Jackson [23] have emphasized the frequent oversight of the esophageal origin of pulmonary disease. They cite regurgitation, overflow, and aspiration of esophageal contents as the cause of the complication. Camiel and Loewe [24] discussed it as a definite syndrome.

A. S., a Negro man, 40 years old, had difficulty in swallowing since accidentally drinking lye solution at the age of 2. There was no history of treatment at the time or since. Dysphagia increased markedly in the last three years. X-ray studies revealed two tight strictures in the upper and middle regions of the esophagus. Dilation with bouginage by esophagoscopy and later over a swallowed string were performed every two weeks for more than two years. Only

23. Jackson, C., and Jackson, C. L.: Pulmonary Symptoms Due to Esophageal Disease. Transactions of the Section on Laryngology, Otology and Rhinology, of the American Medical Association, 1933, pp. 197-213.

24. Camiel, M. R., and Loewe, L.: A Syndrome of Upper Esophageal Stenosis, Ann. Int. Med. **15**:63-79 (July) 1941.

local or no anesthesia was employed for these procedures. During this period of treatment, he had numerous acute respiratory infections ranging in severity from mild suppurative tracheobronchitis to bronchopneumonia. These acute attacks always worsened the dysphagia. A dilation at one of these times caused an acute mediastinitis without signs of a perforation. This cleared up in due time, but the signs of pulmonary disease became progressively more chronic and severe with considerable cough and foul sputum. Eventually a large abscess developed in the right lung, and the patient finally died of an acute aspiration pneumonia superimposed on this extensive chronic pulmonary suppuration.

This is an extreme case which occurred before antibiotics were available for therapy, but it illustrates a real hazard which high esophageal obstruction holds for the lower respiratory tract.

Malignant degeneration occasionally occurs in the scar of a burn from lye. Among approximately 200 patients with esophageal lye burns seen by Bigger and Vinson,[25] carcinoma developed at the site of the stricture in 7. This complication did not occur in the present series.

TREATMENT

Acute Burns.—The emergency treatment in the acute case is an attempt to neutralize the offending agent. Weak antidotes in larger quantity rather than strong solutions should be used. Caustic alkalis can be neutralized with vinegar, or lemon or orange juice. Corrosive acid burns are best treated with magnesium oxide. Sodium bicarbonate should be avoided if possible because it forms gas and is painful and may be dangerous. Olive oil should be given for its emollient effect and for its food value. Water, liquid, and soft food are allowed as tolerated. If the patient cannot swallow, fluids and nourishment should be administered intravenously. Vinson [9] warns against undue haste in considering immediate gastrostomy as the only method of management under such circumstances.

Measures to control shock should be instituted, and sedatives should be given for pain. Penicillin and sulfonamides may be given with the intent of preventing secondary infection. Edema in the larynx must be watched, and the need for tracheotomy appraised.

Gastric lavage or induced emesis to evacuate the stomach contents is commonly condemned as useless and as a potential source of further damage to an already traumatized esophagus. This reasoning may be sound in the case of caustic alkalies which penetrate and coagulate tissues rapidly; but lavage may be of value in acid poisoning in which there is no neutralizing effect in the stomach and in which the pylorus is sometimes attacked. Gastric lavage was performed in 14 of the acute cases in this series and no ill effects due to the procedure were noted.

A Levine tube may be passed and left in position for purposes of feeding and for the maintenance of an esophageal lumen during the stage of acute ulceration. This is not generally recommended, because of the alleged irritation from its presence. Hoag,[26] however, employs this method and finds it very successful and without complications. It was used in only one of our cases, that of a 2-year-old boy who had a severe esophagitis from swallowing lye (drano®) a few hours before. There were no complications, and no stricture developed.

25. Bigger, I. A., and Vinson, P. P.: Carcinoma Secondary to Burns of the Esophagus from Ingestion of Lye, Surgery **28**:887-889 (Nov.) 1950.

26. Hoag, C. L.: Benign Strictures of the Esophagus: New Method of Gradual Dilatation, Ann. Otol. Rhin. & Laryng. **46**:327-337 (June) 1937.

Vinson [27] advocates having the patient swallow a twisted silk thread as soon as the initial swelling has subsided. This maintains a potential lumen even after extensive corrosive damage and furnishes the essential guide for later dilation.

Prophylactic Treatment to Prevent Stricture Formation.—Formerly esophageal burns were treated as conservatively as possible, and the esophagus was kept more or less completely at rest. Strictures were treated only if and when they had developed. During recent years this theory and practice have been entirely reversed. In 1920 Salzer [28] of Vienna discussed the value of early active treatment in the hope of preventing the development of stricture following the ingestion of lye. In 1924 Bokay [29] reported that 132 patients were treated in this manner, with excellent results in 117. The method became widely known in this country through the favorable reports of Martin and Arena [16] in 1939, Gellis and Holt [30] in 1942, Crowe [31] in 1944, and many others more recently.

The technique utilizes dilation by rubber bougies filled with lead shot (Bokay) or mercury (Hurst), which are allowed to pass entirely by their own weight. Size No. 16F. is introduced at the start and the size gradually increased to No. 30F. for a one-year-old child, or to No. 40F. or No. 50F. for an adult. These dilations are begun ideally between the second and fourth days after the accident. They are done daily for two weeks and then at increasingly long intervals for several months and possibly years. The amount of treatment varies in each case. There is now general agreement in regard to the advantage of early dilation but still some difference of opinion as to when it should begin and how it should be carried out. Leegaard [32] states that scar formation cannot be hindered, but it can be controlled. He therefore waits until the second week, when the collagen fibers, the basis of scar formation, appear. It is these fibers which must be stretched and molded until the reparative process is complete.

Daily instrumentation is considered unwise by some. It traumatizes the corroded wall of the esophagus, and the patient's reaction is frequently severe, as evidenced by pain, bleeding, and fever. It is often difficult to keep the patient returning regularly for such lengthy treatment. There is always the possibility that he would have recovered anyway with little or no treatment.

Notwithstanding its disadvantages, the Salzer method of early bouginage is generally conceded to be the best means presently available of preventing cicatricial stenosis following caustic burns of the esophagus.

Management of Chronic Strictures.—Frequently these patients when first seen are badly dehydrated or in an advanced state of malnutrition. In such instances

27. Vinson, P. P.: Management of Benign Stricture, J. A. M. A. **113**:2128-2131 (Dec. 9) 1939.

28. Salzer, H.: Early Treatment of Corrosive Esophagitis, Wien. klin. Wchnschr. **33**:307 (April 8) 1920.

29. Bokay, J.: Salzer's Treatment of Lye Poisoning, Wien. klin. Wchnschr. **37**:282-285 (March 20) 1924.

30. Gellis, S. S., and Holt, L. E.: The Treatment of Lye Ingestion by the Salzer Method, Ann. Otol. Rhin. & Laryng. **51**:1086-1088 (Dec.) 1942.

31. Crowe, J. T.: Poisoning Due to Lye, Am. J. Dis. Child. **68**:9-12 (July) 1944.

32. Leegaard, T.: Corrosive Injuries of the Oesophagus, J. Laryngol. & Otol. **60**:389-414 (Oct.) 1945.

fluids and nourishment should be forced by parenteral routes. Local treatment of the esophageal lesion should be initiated only after the patient's general condition is sufficiently improved to tolerate it safely.

Esophagoscopic examination should be done before any method of treatment is instituted. The stricture is thereby accurately localized, and the type and stage of healing are determined. Examination should be repeated during treatment if there arises unexplained difficulty in passing bougies, or dysphagia, pain, or bleeding.

The treatment of an established stricture requires active dilation by one or more of several methods. The most important of these methods are discussed:

1. Blind Bouginage: This is usually mentioned only to be condemned as unsafe, uncertain, and obsolete. However, the advent of the soft mercury-filled Hurst rubber bougies has brought attention again to this type of dilation. These new bougies are passed by their own weight and not pushed forcibly through the stenosed region. Their action differs from the old concept of blind bouginage. Although designed for the prevention of stricture formation, they are very useful in the treatment of established strictures after they have been dilated previously by other methods. Cody [33] employs these bougies after preliminary dilations by the retrograde method and thereby enables the patients to have their gastrostomy wounds closed much earlier. His patients are also taught to pass their own dilators at home as the occasion demands.

Mercury-filled dilators were used in six of the patients in this report.

S. B., a girl, aged 2 years, had a severe lye burn and stricture in the middle third of the esophagus. A gastrostomy operation was done in December, 1941, and retrograde dilations were performed twice a week until November, 1942. The gastrostomy wound was then allowed to close. Peroral dilation with Hurst bougies was instituted and continued twice a week until February, 1945. She was by that time 5 years of age and was able to swallow a No. 40F. bougie. There was no dysphagia, and a barium swallow revealed normal function. She has remained well.

The other five patients comprised one boy aged 5 and four adults, all of whom were treated at the beginning by esophagoscopic bouginage. After varying lengths of time when the esophageal lumen had become sufficiently dilated to admit at least a No. 26F. bougie, use of mercury-filled bougies was started on these patients, and treatment was continued by this method. The results were satisfactory in all cases.

2. Peroral Esophagoscopic Bouginage: This method has been found by Jackson [34] to be safe and most successful, particularly in single strictures and when gastrostomy is not required. It has a distinct advantage in that it provides an actual view of the esophagus, but unfortunately it permits inspection of only the upper end of the obstruction. In multiple strictures the lower ones must be dealt with more or less blindly. It also requires special facilities and trained personnel. The method is useful in those patients who cannot or will not swallow a thread.

This technique was used in 12 of our cases, more than any other single method. This is explained by the fact that esophagoscopy was performed originally in many of these cases for the removal of an impacted food bolus (five cases) or for diagnosis.

33. Cody, C. C., III: Management of Esophageal Strictures, Arch. Otolaryng. **47**:133-137 (Feb.) 1948.

34. Jackson, C., and Jackson, C. L.: Bronchoscopy, Esophagoscopy and Gastroscopy, Ed. 3, Philadelphia, W. B. Saunders Company, 1934, p. 358.

If a readily dilatable stricture was discovered, and especially if it was situated in the upper segment near the cricopharyngeus, first consideration was given to this method. Some patients required only a few dilations, but two patients had them every two or three weeks for two years. Five patients were transferred to the mercury-filled bougie technique following one to nine esophagoscopic dilations.

3. Peroral Bouginage Using a Silk Thread as a Guide: This method was first used extensively by Plummer [35] and has always been strongly advocated by Vinson. [36] The patient swallows a twisted silk thread, which is then threaded through a fenestrated olive-tipped bougie. This thread is then pulled taut and the bougie is passed through the stricture with the thread as a guide. This is one of the safest methods if the patient can and will swallow a string. It does not require a gastrostomy and it saves the patient the discomfort of an esophagoscopy each time a dilation is performed. It was employed in two of our cases.

One contraindication to this method is the presence of an anatomic loop at any level in the alimentary canal, whether it be an enteroenterostomy, gastroenterostomy (with patent duodenum) or esophagotracheal fistula. If such a loop be present, the danger of its strangulation by a continuous thread must be recognized and some alternative treatment must be employed. This danger was mentioned by Vinson [36] and was emphasized by Hubbard and Leven [37] who reported two fatal cases.

4. Retrograde Bouginage: Tucker [38] was responsible for the development of this method which is known by his name. It necessitates a gastrostomy and a continuous string in the esophagus. By means of this string an expansile rubber dilator can be drawn up into the esophagus to exert uniform pressure on the stricture for varying lengths of time.

This is the most effective and least dangerous method of dilation. It is particularly useful for very severe strictures and is adaptable for multiple ones. It is probably better tolerated by children than peroral procedures. The gastrostomy opening permits early feeding and maintenance of nutrition, and keeps the esophagus at rest.

Heatley [39] emphasized the importance of having the gastrostomy wound low enough in the left rectus muscle to permit easy access to the esophagus. Holinger and Johnston [40] also stress this point, and in addition are of the opinion that the type of gastrostomy is of considerable consequence. They prefer the Witzel type with

35. Plummer, H. S.: The Value of a Silk Thread as a Guide in Esophageal Technique, Surg., Gynec. & Obst. **10**:519 (May) 1910.

36. Vinson, P. P.: The Swallowed Silk Thread as a Guide in Esophageal Instrumentation, Arch. Otolaryng. **13**:94-96 (Jan.) 1931.

37. Hubbard, T. B., Jr., and Leven, N. L.: Esophageal Dilatation: A Contraindication to the Swallowed Thread, and an Alternative Method, Surgery **27**:126-129 (Jan.) 1950.

38. Tucker, G.: Cicatricial Stenosis of the Esophagus with Particular Reference to Treatment by Continuous String Retrograde Bouginage with the Author's Bougie, Ann. Otol. Rhin. & Laryng. **33**:1180-1214 (Dec.) 1924; Strictures of the Esophagus: Diagnosis and Treatment, Laryngoscope **41**:426-438 (June) 1931.

39. Heatley, C. A.: The Treatment of Stricture of the Esophagus, Am. J. Surg. **42**:260-265 (Oct.) 1938.

40. Holinger, P. H., and Johnston, K. C.: Benign Strictures of the Esophagus, S. Clin. North America **31**:135-152 (Feb.) 1951.

the opening in the stomach being made in the greater curvature but directed toward the cardia rather than toward the pylorus as is usually done in the classical Witzel gastrostomy. This facilitates dilation procedures.

There are a few disadvantages in bouginage by the retrograde technique. It requires a gastrostomy even though this may have been otherwise unnecessary. The original introduction of the continuous string may present difficulties and may require complex maneuvers for its passage either perorally or by the retrograde method. The treatment is usually long and tedious. After the largest bougie has been used other methods are required to obtain adequate calibration of the esophageal lumen. A gastrostomy precludes the possibility of a future esophagogastrostomy. The latter fact might be important should some type of surgical repair of the esophagus ultimately be considered advisable.

Bouginage by the retrograde method was employed in four of our cases. All these patients had involvement in the lower esophagus, two with multiple strictures. The results were satisfactory in three patients, but the fourth died of acute starvation before any therapy could be effective.

5. Surgical Repair of the Esophagus: The only indication for surgical resection of benign stricture of the esophagus is failure of adequate attempts at dilation.

Intrathoracic esophageal operations are formidable procedures and until recently have been attempted only as lifesaving measures in cases of malignant lesions. The advent of improvements in anesthesia, chemotherapy, antibiotics, and surgical technique, and the ready availability of blood from blood banks has so increased the safety of these intrathoracic procedures that, in the opinion of Hanckel,[3b] one may feel more confident in recommending surgery for these nonmalignant conditions. Cecil [41] believes likewise, and in 1949 he reported three cases of lye strictures in which esophagogastrostomy was successfully performed. Before this, in 1946, Sweet [42] described the technique of high intrathoracic esophagogastric anastomosis for cicatricial stenosis of the esophagus, discussed its advantages over other surgical methods, and reported three successful cases.

None of the patients in this report has had esophageal surgery, but one is currently being seriously considered for it.

F. R., a Puerto Rican man, was first seen in June, 1948, when 21 years of age. He had a history of being poisoned when a baby by drinking something thought to be lye. His early record was indefinite but he was known to have had dysphagia since the age of 16. Esophagoscopy in Puerto Rico in 1946 was followed by 18 or 20 dilations with bougies. He was first seen here for an impacted meat bolus, which was removed by esophagoscopy. Two tight strictures are present in the upper and middle thirds of the esophagus. He refuses to swallow a string. Many esophagoscopic dilations have been performed during the last three years. Both strictures have been penetrated, but only the upper one has been adequately visualized. The patient is uncooperative, careless about his diet, and irregular in keeping his appointments for dilations, especially as soon as his dysphagia lessens. As a consequence he has had 12 hospital admissions in three years for esophagoscopic removal of impacted food boluses. Several other food impactions have been regurgitated before they could be extracted. Nearly all these episodes have taken place in the night with the resultant extra effort for the hospital and medical personnel. The largest

41. Cecil, A. B., Jr.: The Surgical Management of Lye Strictures of the Esophagus, North Carolina M. J. **10**:199-203 (April) 1949.

42. Sweet, R. H.: Subtotal Esophagectomy with High Intrathoracic Esophagogastric Anastomosis in the Treatment of Extensive Cicatricial Obliteration of the Esophagus, Surg., Gynec. & Obst. **83**:417-427 (Oct.) 1946.

bougie successfully passed has been No. 24F. After a lapse in treatment the caliber is frequently such as to admit only No. 8F. On several occasions the impaction has been lodged in the region between the two strictures, rendering its presence more dangerous and its removal more difficult.

This case might conceivably prove amenable to retrograde methods of bouginage. However, it is questionable whether those methods would solve all the problems. It is reasonable to presume that this patient would be benefited by a surgical resection of the esophagus.

ANTIBIOTICS

The use of antibiotics was mentioned as an adjuvant in the treatment of acute burns. In the present series penicillin was administered in six recent cases, and in one case it was combined with sulfonamides. Two of the patients had hopelessly severe third-degree burns; one died and the other was transferred because of an acute psychosis and was not followed. The four remaining patients had second-degree burns, three caused by lye and one by ammonia. Penicillin injections were started in all cases within 24 hours of the accident and continued in adequate dosage for three to nine days. By comparing these few patients with analogous ones who were not given penicillin, an attempt was made to determine the value of the antibiotic. No dramatic differences were noted in the severity and duration of dysphagia or in the elevation and duration of the primary fever. The healing time of the ulcers in the mouth, pharynx, and larynx was slightly shortened. No strictures developed, the patients having, of course, additional appropriate therapy.

Infection is probably a lesser factor in acute burns of the esophagus than it is in burns of the skin. Colebrook [43] has shown that skin burns run a greater risk of infection by air-borne organisms than by contact. The esophagus is relatively protected by its anatomical position. However, some infection is undoubtedly present in all cases with ulceration and, unless a contraindication exists, the prophylactic administration of penicillin would seem warranted.

Rebatter and Martin [44] found that under the influence of the antibiotics, especially penicillin, the duration of the primary inflammatory esophagitis was reduced. Dilations could therefore be started earlier, and fewer temperature reactions were induced by the manipulations.

Stricture formation, which is caused by deep tissue coagulation necrosis and its subsequent reparative processes, is probably not directly influenced to any great degree by the antibiotics. Infection may prolong the healing, but the basic damage is done by the corrosive chemical.

In such serious complications as abscess formation, septicemia, perforation of the esophagus, mediastinitis, and pulmonary infection, the indispensability of the antibiotics cannot be denied.

CORTISONE AND CORTICOTROPIN (ACTH)

The use of adrenocortical extract (cortisone) and pituitary adrenocorticotropic hormone (corticotropin) in burn therapy has not yet been established. The mode of action of these substances is unknown, although it is known that there is a dis-

43. Colebrook, L.: Outstanding Problems in the Treatment of Burns, Lancet **2**:273-278 (Aug. 18) 1951.

44. Rebatter, J., and Martin, H.: Results of Modern Therapies for Caustic Burns and Stenoses of the Esophagus, J. méd. Lyon **29**:643-647 (Sept. 20) 1948.

turbance of adrenocortical function in patients with burns. Among the effects of these hormones are suppression of fever and of early constitutional reactions, and diminution of fibroblastic proliferation. Conflicting evidence has been submitted as to the interference of these substances with wound healing, and few reports have yet appeared as to their precise effect on the healing of burns. Recently, after experimental production of localized sodium hydroxide burns of the esophagus in rabbits, Rosenberg and co-workers [45] demonstrated that cortisone, by inhibiting fibroplasia, greatly diminished the tendency to scar-tissue contracture. However, a high incidence of suppurative complications, mostly intrathoracic, was noted in the cortisone-treated group of animals.

In the management of chemical burns of the esophagus the major problem is the prevention and treatment of stricture. Any noninjurious therapeutic agent which proved able to inhibit the formation of scar tissue in such circumstances would be an invaluable addition to our present scheme of treatment. Further investigation of these substances is required to evaluate their potential usefulness.

SUMMARY

1. Forty-seven cases of chemical burns of the esophagus observed and treated at St. Luke's and Roosevelt hospitals over a 15-year period are reviewed.

2. The incidence of these accidents is analyzed in regard to the age and sex of patients, the causative agent, and manner of ingestion.

3. The pathology and symptomatology are described, with presentation of illustrative cases. The distinguishing characteristics of burns caused by caustic alkalies and those caused by corrosive acids are noted. The prolonged latent interval which sometimes occurs before signs of cicatricial stenosis appear is stressed.

4. The pulmonary complications which are often overlooked or misinterpreted in patients with chronic esophageal stenosis are emphasized.

5. The treatment of acute burns is outlined.

6. The management of chronic strictures is explained and the relative merits of the various methods employed are discussed.

7. The role of the antibiotics in the treatment of chemical burns of the esophagus is evaluated.

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45. Rosenberg, N.; Kunderman, P. J.; Vroman, L., and Moolten, S. E.: Prevention of Experimental Lye Strictures of the Esophagus by Cortisone, A. M. A. Arch. Surg. **63**:147-151 (Aug.) 1951.

PAROTID GLAND TUMORS

Study with Reference to Origins

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ALTHOUGH in recent years an increasing number of competent investigators have become convinced that the so-called mixed tumors of the parotid gland are of purely epithelial origin, there is no real unanimity concerning the histogenesis or the structure of these tumors.

Despite the fact that the epithelial-appearing portions of these neoplasms assume a variety of histological appearances, as, for example, nearly normal-looking salivary tissues, atypical glandular tissue, solid epithelial formations, epithelial formations with cystic spaces, and carcinoma especially of the basal-cell type, the controversy is not due to this pleomorphism. It is, rather, dependent upon the mesodermal-appearing portions of the growths and most particularly upon the "cartilaginous" structures which are so often present. It is this "cartilage" which is the crux of the problem. Is it, or is it not, true cartilage? If it is true cartilage, it has most likely arisen from mesenchymal elements, in which case the growths are truly mixed tumors. If it is true cartilage and does not arise from mesenchymal elements, then it must represent a metaplasia from epithelial elements. In accordance with the fact that the trend of thought is toward acceptance of the purely epithelial origin of these tumors, it is also more frequently considered that this "cartilage" is not true cartilage at all but is rather a change in the "myxomatous" tissue, which is an almost constant feature of these growths, and that, further, this myxomatous tissue is not mucoid connective tissue but rather itself an epithelial product.

The present study started as an attempt to determine how often, if at all, true cartilage is found in mixed tumors. The main difficulty in such a pathological study was immediately apparent, as it has been to others, and consisted in the fact that there is no stain which is specific for cartilage. The judgment, then, had to be made on the usual histopathological criteria.

MATERIALS, METHODS, AND OBSERVATIONS

Twenty-nine mixed tumors of the parotid gland were studied. A number of blocks from each tumor were cut and stained with hematoxylin and eosin. After the slides were studied, the tumors were divided into three groups: (1) those with obviously no cartilage; (2) those with questionable cartilage, and (3) those with definite cartilage. Four tumors showed neither cartilage nor any other type of tissue that could possibly be confused with cartilage. These would probably have been classified by some investigators as simple salivary adenomas, but they are more

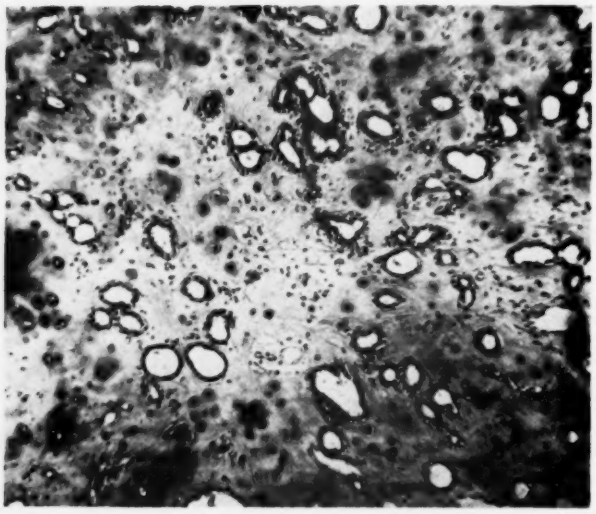

Fig. 1.—Cartilage-like cells in a mixed tumor of an adult parotid gland. Hematoxylin-eosin stain; × 70.

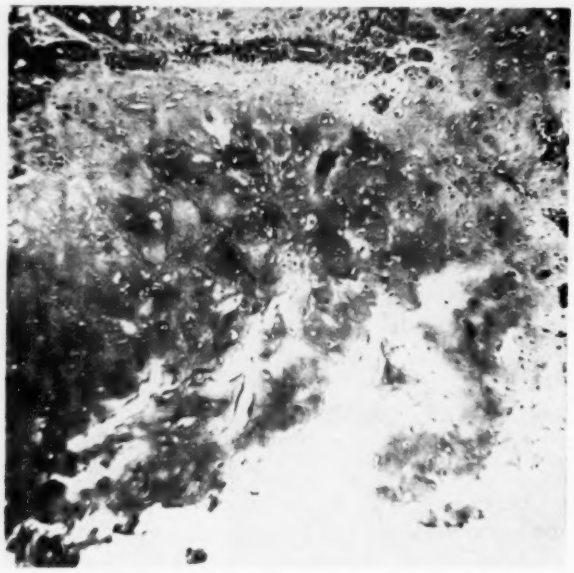

Fig. 2.—Cartilage-like tissue in a mixed tumor of an adult parotid gland. Hematoxylin-eosin stain; × 70.

properly to be classified as mixed tumors, since they have the same origin as most of the latter and merely represent a variant of the whole group, namely, the most slowly growing and innocuous variety with a uniformly differentiated structure. Twenty-three parotid tumors were classified as having questionable cartilaginous tissue. In this group were included all those tumors which contained areas of myxomatous connective tissue. This myxomatous tissue itself was of all degrees of differentiation, from that which appeared to be edematous mesenchymal tissue, which really had little resemblance to cartilage, to myxomatous tissue with a few scattered large cells with empty cytoplasm and rather centrally placed hyperchromatic nuclei. The latter type was often difficult to distinguish from cartilage and may have been classified as such by another observer. Two tumors of the 23

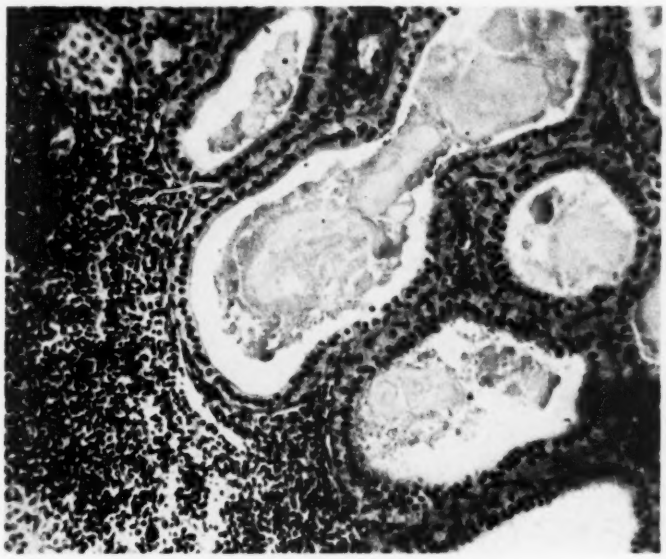

Fig. 3.—Adenolymphoma. Note the lymphadenoid tissue and glandular structures. Hematoxylin-eosin stain; × 200.

studied contained areas which were from a histological standpoint true cartilage. This cartilage was of the infantile type and showed very little degenerative changes. It is true, as was already stated, that in the 23 cartilage-like specimens some of the areas of myxomatous tissue appeared very similar to cartilage. It is not difficult, then, to understand how a further only slight change and differentiation of the tissue are needed to cross the line and have the tissue appear as true cartilage. This may be, as shall be discussed later, what occurs in most if not all of the tumors in which cartilage-like areas occur. But were the explanation so clear-cut there would be no controversy, and differences of opinion do still exist. And from a histological standpoint, which is the only present basis of study, one is forced to say that areas indistinguishable from true cartilage do exist in a small percentage of mixed tumors of the parotid.

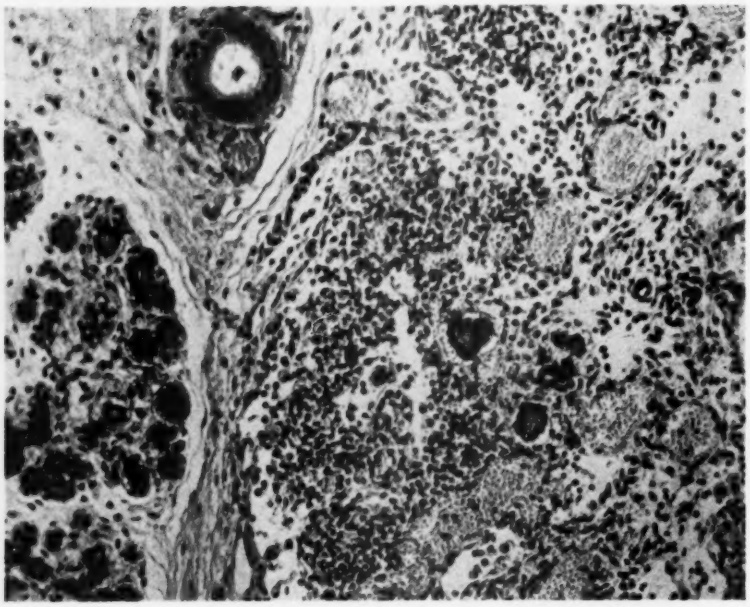

Fig. 4.—Parotid structures within lymphadenoid tissue in a newborn infant. Note the adjacent parotid gland. Hematoxylin-eosin stain; × 70.

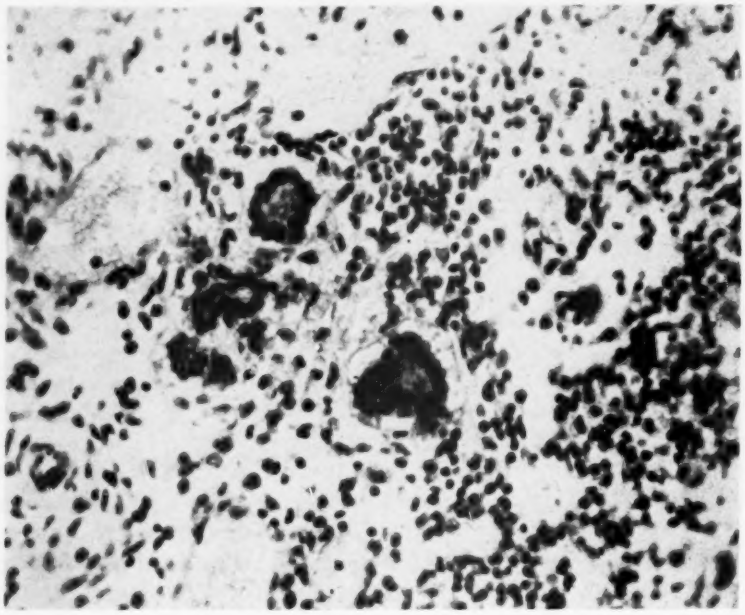

Fig. 5.—Parotid structure within lymphadenoid tissue in a newborn infant. Hematoxylin-eosin stain; × 200.

Next it was thought that it might be interesting and informative to see whether perhaps cartilage could be found in the parotid glands of infants. If so, it would be possible that some of the cartilage found in mixed tumors could take its origin from preformed cartilage in the gland, and one would be justified in feeling that there is present in the parotid gland at any age cells which have the potentiality of cartilage formations.

Therefore in 19 instances the parotid glands of newborn full-term and premature infants were examined with special reference to the presence of structures other than glandular ones within the parotid. The glands of the infants were divided into several blocks, and a number of sections from each block were examined. Thus the entire parotids from the infants could be studied.

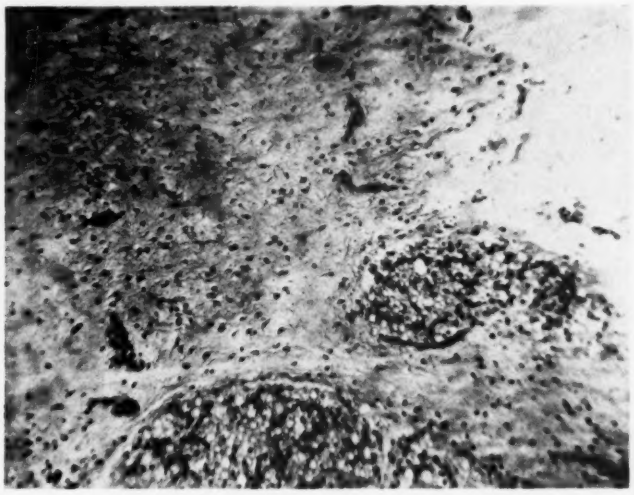

Fig. 6.—Edematous connective tissue in a fetal parotid gland. Hematoxylin-eosin stain; × 70.

The outstanding change found in the parotids of newborn infants was the presence of small acini within lymphadenoid tissue. Sometimes minute lymph nodes were found in the capsule of the parotid, and on close inspection it was noted that there was not a sharp line of demarcation between the lymph node and the parenchyma of the parotid. Often, too, comparable to a malignant tumor, smaller and larger parotid acini were found, seemingly invading the lymph node. Occasionally, also, a small duct was found in these areas. Both the duct and the acini did not differ in any respect histologically from the ducts and acini found in the other portions of the parotid, with the exception, of course, that many small areas of lymphatic tissue were found between individual acini and between the acini and the smaller ducts. In other fields islands of acini were found in the middle of lymphadenoid tissue or obvious lymph nodes, and no direct connection could be found between these islets of acini and the remainder of the parotid. However, serial sections from these areas were not taken, and so it cannot be definitely stated whether

or not at a higher or lower level these islets perhaps had extended from the adjacent parotid into the lymph node. Most commonly the lymphadenoid tissue or lymph nodes with groups of parotid structures were found at the periphery of the gland, and only occasionally lymphadenoid tissue with parotid structures was found in the midst of the parotid. Because of the simultaneous findings of both acini and glandular structures within lymph tissues or lymph nodes, the term "adenoidal lymph node" is proposed.

Another microscopic change of significance was the loose and often edematous connective tissue found between groups of acini and often also between individual acini. In some instances the connective tissue cells were swollen and sometimes triangular in shape, suggesting myxomatous degeneration. Often, too, small halos

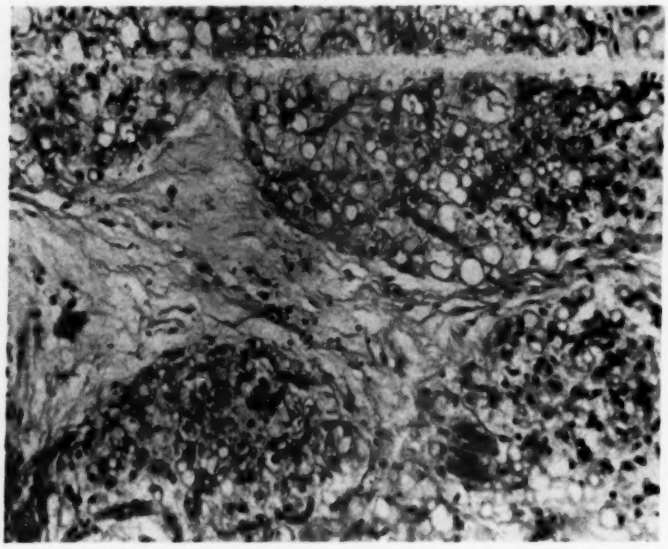

Fig. 7.—Lobular adipose tissue in a fetal parotid gland. Hematoxylin-eosin stain; × 130.

were found between individual cells of the fibroblastic variety, these halos indicating perhaps an edematous material which had escaped in processing the slide. It was interesting to note that occasionally these connective tissue cells resembled degenerated cartilage cells. Another interesting finding was the presence of large areas of fat cells, arranged in groups which were surrounded by connective tissue. Sometimes the arrangement of the fat lobules resembled roughly in their shape and arrangement lobules of the parotid, the main difference, of course, being that no parotid structures were found within these fat lobules. The stroma was of similar appearance to the parotid stroma, and the distribution of blood vessels was also similar to that of the parotid acini. Whether or not these fatty lobules constitute preformed spaces, to be taken up later by the growing parotid, cannot be stated.

Cartilage was not encountered in any of these parotids.

COMMENT

Fry [1] has written an excellent review of the theories of formation of mixed tumors and has contributed a valuable study showing the epithelial nature of the tumors. He states that the theory which had the origin of such tumors in the endothelium of lymph vessels has been discarded. According to the embryonic theory, dysembryomas are tumors derived from pluripotential cells which have ceased to develop further at different stages of the development of the embryo and have later given rise to neoplasms. The main reason for this theory was the cartilage. Since in his work Fry demonstrates that the tissue which goes by the name of cartilage is formed from epithelial tissues, he feels it is unnecessary to consider this theory further. If one considers that these tumors arise from embryonic rests of gland tissue, it is necessary to assume that the rests consist of both ectodermal and mesodermal elements or that the connective tissue is derived through metaplasia of epithelium.

In considering the origin from fully formed gland tissue it is probable that the cellular portion of most tumors is derived from the ducts of glands, but occasionally it may arise from secreting cells.

Fry's description of the origin of "cartilage" is given in detail. He states that most tumors have a substance which stains deeply with Mayer's mucicarmine. This substance is most prominent in the less cellular parts, where it forms an intercellular substance filling up the spaces between the scattered cells or groups of cells. It varies greatly in its intensity of staining: When it stains well, it often has a fibrillar structure; when it stains not so intensely, it often has a more homogeneous appearance. This material is formed in the following ways: (1) by secretion of mucin into intracellular vacuoles; (2) by granules of mucin in the cytoplasm of cells; (3) by mucin which is found in duct-like structures, and (4) by intracellular formation of mucin. One may ask where this mucin comes from, since the parotid, from which the majority of these tumors arise, ordinarily contains no mucus cells. However, the formation of mucin may be one of the normal functions of the cells of the parotid, and the formation of mucin by the tumor cells may be looked on merely as an exaggeration of a normal process.

As the mucin in these tumors increases in amount, changes take place, the nature of which depends on whether the secretion is intracellular or extracellular. When the secretion is extracellular, the cells become unduly separated as more mucin is produced. When, however, the secretion is intracellular, the vacuoles become larger, they coalesce more and more, and ever-increasing spaces filled with mucin are formed. In the breaking-down of the walls between vacuoles one or more cells often become separated from the main mass of cells and come to lie loose in the mucin, until finally large areas of mucin are formed, containing numbers of isolated cells or small groups of cells scattered throughout. As the patch of mucin increases still more in size, a further change often takes place. Toward the center of the patch the mucin loses its fibrillar structure and gradually becomes more homogeneous in appearance; at the same time it stains more deeply with mucicarmine. It tends to shrink away from the isolated cells scattered through it, leaving

1. Fry, R. M.: The Structure and Origin of the "Mixed" Tumors of the Salivary Glands, Brit. J. Surg. **15**:291, 1927.

them lying in small vacuoles. Around the periphery of these vacuoles the mucinous material is often more condensed and takes the stain more deeply. It is this appearance which has caused the material to be described as cartilage, and at first sight the resemblance is so close in some cases that one is almost irresistibly drawn to the conclusion that it is cartilage. It is only by following out the way in which this material is produced that a correct idea of its nature can be formed. The transition of mucin to the homogeneous material, the matrix of the so-called cartilage, is gradual and is probably caused by some change in its chemical composition. This substance cannot be distinguished in many cases from the matrix of cartilage, either by its microscopic appearance or by its staining quality.

As a result of these observations Fry concluded that in the tumors of this series cartilage did not exist. There was in many places a tissue closely resembling cartilage, but the cells in it were epithelial cells, derived from the other epithelial cells of the tumor, and the matrix was a degeneration product of the mucin, which was formed by an exaggeration of the normal function of the epithelial cells.

Patey [2] believes that mixed tumors of the salivary glands are a composite group of epithelial tumors, the varying pathological features of which depend on the degree of differentiation attained, the rapidity of division of cells, and the amount of myxomatous change undergone by the epithelium. According to the degree to which these changes have taken place, all gradations may be encountered between a myxoma, on the one hand, and a highly differentiated tumor with ducts and acini, on the other, and between a slowly-growing tumor with regular cells and an irregular, anaplastic growth.

Li and Yang [3] believe that mixed tumors are probably embryonic tumors of local origin. From histological, regional, and histogenic points of view they seem naturally to fall into two groups: intraoral and extraoral. The first group, which includes tumors of the salivary glands, are derived from embryonic rests from invagination of oral epithelium. Tumors of extraoral origin result from ectodermal inclusions caused by the fusion of branchial clefs and various fissures of the head and neck. The histological similarities and differences among the mixed tumors and tumors closely allied to them are explained by differences in the origin and the time of their rest formation.

Hemplemann and Womack [4] have discussed the pathogenesis of mixed tumors in considerable detail. They cite Hoepfel as the first to divide mixed tumors into three main groups, based on an interpretation of their parenchymal elements. Billroth thought the parenchyma was of mesenchymal origin. Virchow felt that the epithelium was derived from mesenchyme, owing to the ability of the connective tissue elements to undergo metaplasia into epithelial tissues. In the second group, in which the parenchyma is believed to be derived from epithelium, differences of opinion as to the nature of the stroma cause the formation of five subgroups: 1. The stroma takes its origin by displacement of the mesodermal germ tissue at the same

2. Patey, D. H.: The Mixed Tumors of the Salivary Glands, Brit. J. Surg. **18**:241, 1930.

3. Li, P. L., and Yang, C. S.: An Inquiry into the Origin of the Mixed Tumors of the Salivary Glands with Reference to Their Embryonic Interrelationships, Am. J. Cancer **25**:259, 1935.

4. Hemplemann, L. H., Jr., and Womack, N. A.: The Pathogenesis of Mixed Tumors of the Salivary Gland Type, Ann. Surg. **116**:34, 1942.

time in embryonic life as the ectodermal elements. 2. The stroma is mesodermal tissue which is formed as the result of the improper "organizer" action of the epithelium on undifferentiated mesoderm. 3. The stroma is a mesodermal tissue which has been formed by metaplasia of the epithelial parenchyma. 4. The stroma is epithelium which has been modified as a result of its secretory products so that it resembles cartilage and other mesodermal tissues. 5. The stroma is a hybrid substance, arising through the union of epithelial and mesothelial tissues with their secretory products. For the third major division, the theory that the parenchyma possesses epithelial as well as endothelial components, the evidence is very vague.

Hemplemann [4] has devised certain microchemical methods by which, he states, mesenchymal and epithelial mucoids can be differentiated. Chondroitin sulfuric acid has been isolated only from mesenchymal tissues, such as cartilage, bone, tendon, sclerae, umbilical cord, and the wall of the aorta. Therefore, chrondroitin sulfuric acid protein complex is said to be the mucoprotein of connective tissue, while mucoitin sulfuric acid, found in the mucin of salivary glands and gastric mucosa and in serum mucoids, ovamucoid, Wharton's jelly, vitreous humor, and the cornea, is limited to tissues of epithelial origin. Two chemical methods show that the mucoid in the myxomatous and cartilaginous areas in mixed tumors of the salivary glands behaves exactly as does the mucoprotein complex in skeletal cartilage, chondromas, chondrosarcomas, and the walls of arteries showing mucoid degeneration. The mucoid within the acini stains exactly as does the mucoprotein complex in the mucin of the salivary gland and the gastrointestinal and respiratory tracts. Therefore it seems reasonable to conclude that the mucoid in the cartilaginous-myxomatous areas is a mesodermal mucoprotein, and, since the tissue presents the morphologic appearance of mesodermal structures, it is probable that these tissues are truly mesodermal. The metaplasia of epithelial cells into true cartilage and myxomatous tissue after histodifferentiation has taken place is contrary to present embryologic concepts. The conclusion seems to be, then, according to this line of investigation, that there are two kinds of tissue, mesenchymal and epithelial, in mixed tumors of the salivary-gland type.

Hemplemann believes that, in view of this conclusion, certain theoretic concepts as to pathogenesis can be formulated. He believes that normal development depends upon a closely integrated interrelationship among all the tissues involved. Such "organizer" or "provocative" action of epithelium on the undifferentiated mesoderm, and vice versa, in the formation of certain tumors has been suggested by Norrenbrock after Schurmann and Pflüger's work on the histogenesis of craniopharyngiomas. Schmidt has applied this principle to mixed tumors of the breast, and Möller and Womack and Graham have used it to explain certain tumors of the lungs. The experimental disturbance of tissue environment of the embryo has been shown to lead to structural malformations. It is possible that some such disturbance may lead to the development of mixed tumors. The time during embryonic life that such disturbance occurs would account for the degree of differentiation which the tissues show. The earlier in life this disturbance occurs, the greater the potentiality of differentiation. According to this "organizer" conception, mixed tumors are a result of primary epithelial maldevelopment, with mesodermal differentiation secondary to this epithelial disturbance.

Halpert and Tool [5] believe that the lesions are anlage tumors. They feel that their sites of origin and their structural patterns suggest that, like adamantinomas and craniopharyngiomas, they are derived from embryonal rests of the ectoderm. The structural differences may be attributed partly to the influences of the environment on the tumors in their respective sites and partly to the stage of evolution of the cell rests at the time of separation from the ectodermal anlage. The salivary-gland tumors seem to be the oldest genetically. The group of cells from which they originate must have separated from the ectoderm at the stage when they had not as yet acquired their dominant characteristics as ectodermal and mesodermal tissues. The adamantinomas and craniopharyngiomas are evidently of more recent origin; hence their simpler range of separation in cellular pattern. The stroma of these growths is a contribution of the surrounding connective tissue, whereas in tumors of the salivary glands it is a part of the neoplasm.

McFarland believes that these tumors do not arise from salivary tissue and thinks that enclavement of embryonic cells affords the best explanation of their origin.

MacCallum considers as acceptable the view that these tumors represent the teratoma derived from the isolation of cells already in an advanced state of differentiation.

Although Ewing [6] seemed to support the epithelial origin of the tumors, he also was able to state that no single source of the mixed tumors meets all the requirements; that some of the tumors probably arise from misplaced and, occasionally, embryonal portions of gland tissue, and that branchial remnants may possibly be connected with this group. Ewing also felt that the derivation of mucous tissue and cartilage from gland epithelium had been satisfactorily proved.

Willis [7] gives an excellent discussion of these tumors. He feels strongly that they are not mixed but arise from and consist of salivary epithelial tissue only and that, with rare exceptions, they contain no mucous connective tissue and no cartilage. He feels that the so-called cartilage represents only a further change in myxomatous tissue in which the epithelial cells have become more widely separated and partly detached from one another in the mucinous matrix. He does not believe that the conclusions of Hemplemann and Womack, previously cited, are justified. Because of his conviction about the purely epithelial nature of these growths, Willis objects to retaining the term "mixed" and prefers instead the adjective "pleomorphic."

Although this study was originally concerned with the problem of so-called mixed tumors, the invariable finding, in the parotids of newborn infants, of the presence of small acini within lymphadenoid tissue brought into focus relatively rare growths of the salivary glands, adenolymphomas. These constitute less than 10% of all salivary tumors.[8] They are slowly growing benign tumors, occurring usually

5. Halpert, B., and Tool, C. D.: Anlage Tumors of the Salivary Glands, Cancer Res. **7**:346, 1947.

6. Ewing, J.: Neoplastic Diseases: A Treatise on Tumors, Ed. 4, Philadelphia, W. B. Saunders Company, 1940.

7. Willis, R. A.: Pathology of Tumors, St. Louis, C. V. Mosby Company, 1948.

8. Plaut, J. A.: Adenolymphoma of the Parotid Gland, Ann. Surg. **116**:43, 1942.

in males and mostly during the fifth and sixth decades of life, and are most frequently found in the preauricular region or near the angle of the lower jaw. The rate of growth is slow but variable, and the duration of the preoperative history varies from a few months to 20 to 30 years. They are usually encapsulated and easily enucleated. They may be solid or cystic, most frequently the latter. Microscopically they consist of tall columnar epithelium supported by lymphoid stroma with active germ centers. The epithelium lines the cysts, clothes the papillae, and in solid areas forms small glandular acini in the midst of the lymphoid tissue. This type of tumor has also been called papillary cystadenolymphoma or papillary cystadenoma lymphomatosum.

Neisse [9] in 1896 showed that in a fetus of 120 mm. there are numerous lymph nodes within the parotid and later in the submaxillary gland as well. These nodes contain salivary tubules within their substance, and at a later date, when they become defined and encapsulated to form the preparotid lymph glands, the tubules which they enclose may lose their connection with the rest of the parotid and so remain for indefinite periods. Neisse was able to demonstrate this in all the newborn infants whom he examined. Nicholson in 1922 reported the persistence of such tubules in a woman of 25.

In 1910 Albrecht and Arzt reported the first two cases of adenolymphoma. They considered that they were dealing with tumors of endodermal (possibly salivary gland) origin, occurring within lymph nodes, and that the growths were examples of tissue displacement or dystopia. Glass in 1912 felt that the tumors arose from salivary gland tissue enclosed within lymph nodes and that the primary fault was one of abnormal blending of tissues. Ssobolew in 1912 and Feldman in 1916 thought that they arose from inner branchial pouches.

Hamperl in 1931 drew attention to a type of cell in the salivary gland of old people which appears by a process of dedifferentiation from both glandular and duct epithelium and which in its finer structure more closely resembles the epithelial elements of the tumor than does normal salivary epithelium. These cells had been termed "pyknocytes" by Zimmerman. Hamperl called them "onkocytes" and considered them the cells from which adenolymphomas take their origin.

Jaffé [10] in 1932 developed Hamperl's suggestion and proposed that the tumor should be called onkocytoma. In his opinion the tumors arise in onkocytes differentiated from heterotopic salivary-gland and duct tissue included within lymph nodes of the parotid and submaxillary region. The hypothesis is but a slight variant of the original view of Albrecht and Arzt, merely assuming the formation of "onkocytes" as a necessary preliminary to the development of the true neoplasm.

Carmichael, Davie, and Stewart,[11] who have written an excellent account of adenolymphomas, feel that both constituents appear to participate in the neoplastic process. They find most acceptable the hypothesis which refers the origin of the tumor to salivary-duct epithelium and lymphoid tissue abnormally blended during development.

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9. Neisse, R.: Über den Einschluss von Parotisläppchen in Lymphknoten, Anat. Hefte **10**:287, 1898.

10. Jaffé, R. H.: Adenolymphoma (Onkocytoma) of the Parotid Gland, Am. J. Cancer **6**:1415, 1932.

11. Carmichael, R.; Davie, T. B., and Stewart, M. J.: Adenolymphoma of the Salivary Glands, J. Path. & Bact. **40**:601, 1935.

Kraissl and Stout [12] discuss the orbital inclusion which is a vestigial closed tubular structure lined with ectodermal epithelium which lies in contact with the lower portion of the parotid gland. Since it is well known that closed tubular vestiges in other parts of the body may form cysts in adult life, it seems reasonable to Kraissl and Stout to assume that the probable origin of these lymphoepithelial cysts of the matured parotid is from a dilatation and proliferation of the orbital inclusion.

Freshman and Kurland [13] note that some investigators have seen in such tumors what resembled thymic tissue and that others have seen tissues closely resembling the acidophilic cells of the parathyroid gland. Therefore they feel that in some cases there is reason to adduce the origin of adenolymphomas from branchial pouches, the particular pouch not being the same in every instance. Bonifagi, on the other hand, pointed out that the branchial pouches take no part in the formation of the parotid gland.

Lloyd [14] feels it is unnecessary to postulate an origin for the adenolymphomas different from the pure origin of mixed adenomas. He feels it is reasonable to assume that the adenolymphomas are derived from the same embryonal glandular replacement epithelium which gives rise to other salivary adenomas but that they differ from other adenomas chiefly in having a greater amount of associated lymphoid stroma. He feels that this distinguishing factor is not remarkable when one considers the intimate relationship which often exists between salivary glandular tissue and the local lymph nodes.

Willis agrees with Nicholson that adenolymphomas are adenomas of heterotopic salivary tissue in the preparotid lymph glands.

From my investigation, in particular from the findings of lymphadenoid structures in which typical parotid elements were present, it would seem clear that these adenolymphomas are tumors which arise in such preformed structures. The burden of proof usually lies upon the one who assumes the theory that is difficult to substantiate or who believes that such a tumor arises from misplaced structures not present a priori. Again, since these lymphadenoid structures intermingled with parotid ducts were found in such a high percentage of subjects under normal conditions, it seems to me that the most satisfactory explanation is that the occasionally occurring adenolymphomas arise in these preformed structures.

SUMMARY AND CONCLUSIONS

From a study of so-called mixed tumors of the parotid gland it seems that a small percentage of such tumors contain tissue which is histologically indistinguishable from true cartilage, and on a microscopic basis one would be forced to say that true cartilage does exist in some mixed tumors of the parotid. However, when one carefully notes the subtle gradation throughout the entire range of myxomatous tissue blending into this cartilage, one is forced to conclude that the cartilage-like tissues are but variants of the same myxomatous tissue. Since this myxomatous

12. Kraissl, C. J., and Stout, A. P.: "Orbital Inclusion" Cysts and Cysto-Adenomas of the Parotid Salivary Glands, Arch. Surg. **26**:485, 1933.

13. Freshman, A. W., and Kurland, S. K.: Cystadenoma Lymphomatosum, Am. J. Clin. Path. **8**:422, 1938.

14. Lloyd, O. C.: Salivary Adenoma and Adenolymphoma, J. Path. & Bact. **58**:699, 1946.

tissue is an epithelial product rather than a mesenchymal one, the so-called cartilage is also epithelial in origin, and mixed tumors are of purely epithelial origin. In addition, no cartilage or cartilage-like structure which could be considered as a favorable anlage structure was seen in the parotids of newborn infants.

We have confirmed the observation of Neisse concerning the constant presence of "adenoidal lymph nodes" in the parotid of the newborn infant. Because of their similarity of appearance and structure, it seems most reasonable to assume that these "adenoidal lymph nodes" are the origin of the adenolymphomas of the adult parotid gland.

Case Reports

CHONDROSARCOMA OF THE LARYNX

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CHONDROSARCOMA of the larynx is a rare lesion. Havens and Parkhill [1] reviewed 1,100 cases of malignant tumor of the larynx observed at the Mayo Clinic from 1910 to 1940. They found only 11 cases of sarcoma, of which two were chondrosarcomas. In that series carcinoma occurred 100 times as frequently as sarcoma. Clerf [2] reported that 740 cases of carcinoma of the larynx were encountered from 1930 to 1946 at the Jefferson Hospital. During this time only eight sarcomas, of which one was classified as chondrosarcoma, were observed. Jackson and Coates [3] found no instances of sarcoma in a series of 643 cases of malignant tumor of the larynx observed up to 1929. Thomson and Colledge [4] observed only one case of sarcoma in their experience.

Eighty-nine cases of chondroma of the larynx have been reported in the literature. Moore [5] found 53 cases recorded before 1925. McCall [6] found 32 additional cases between 1925 and 1944. Single cases were reported by Rosedale,[7] Moore,[8] Link,[9]

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1. Havens, F. Z., and Parkhill, E. M.: Tumors of the Larynx Other Than Squamous Cell Epithelioma, Arch. Otolaryng. **34**:1113-1122 (Dec.) 1941.

2. Clerf, L. H.: Sarcoma of the Larynx: Report of Eight Cases, Arch. Otolaryng. **44**:517-524 (Nov.) 1946.

3. Jackson, C., and Coates, G. M., editors: The Nose, Throat and Ear and Their Diseases, in Original Contributions by American and European Authors, Philadelphia, W. B. Saunders Company, 1929, p. 991.

4. Thomson, St. C., and Colledge, L.: Cancer of the Larynx, London, George Routledge & Sons, Ltd., 1930, p. 16.

5. Moore, I.: Cartilaginous Tumors of the Larynx, J. Laryng. & Otol. **40**:9-14 (Jan.); 84-109 (Feb.); 145-164 (March) 1925.

6. McCall, J. W.; Dupertius, S. M., and Gardiner, F. S.: Chondroma of Larynx: Review of Literature and Report of 2 Cases, Laryngoscope **54**:1-17 (Jan.) 1944.

7. Rosedale, R. S.: Laryngeal Chondroma, Arch. Otolaryng. **45**:543-549 (May) 1947.

8. Moore, P. M., Jr.: Chondroma of Larynx, Cleveland Clin. Quart. **15**:4-8 (Jan.) 1948.

9. Link, M. R.: Chondroma and Chondrosarcoma of the Larynx, Ann. Otol. Rhin. & Laryng. **58**:70-85 (March) 1949.

and Ryan.[10] Only four cases of chondrosarcoma could be found in the literature.[11] The following report constitutes another case.

REPORT OF A CASE

A 62-year-old ordnance inspector was admitted to the hospital on March 2, 1951, with symptoms of hoarseness, stridor, and dyspnea of one month's duration. Hoarseness was the first symptom, followed by a severe attack of dyspnea and noisy stridor which made him seek medical care. The patient coughed up about ½ teaspoonful of bright red blood for the first time on the day of admission.

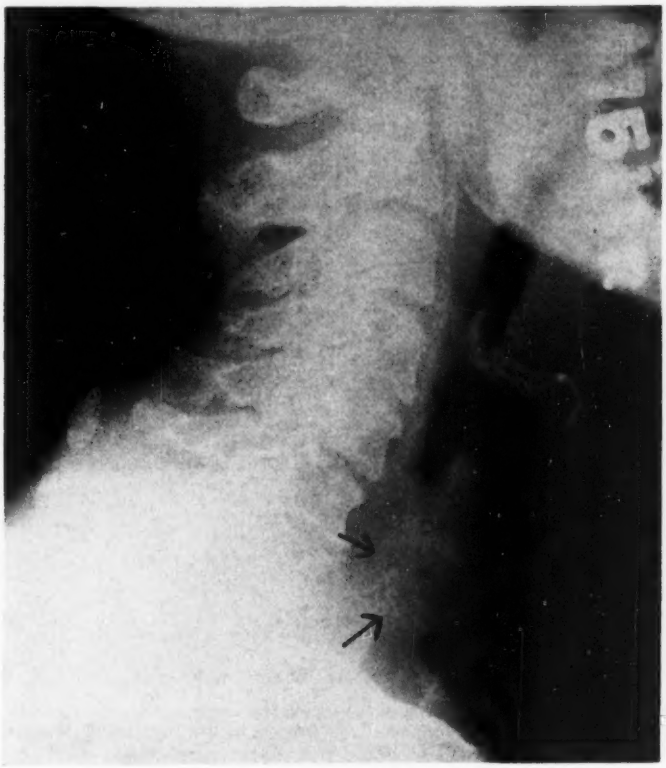

Fig. 1.—Lateral roentgenogram of the neck, taken on admission, showing subglottic tumefaction with fine linear calcification.

Physical examination revealed a well-developed and well-nourished white man in good physical condition. His voice was hoarse, and there was slight laboring on inspiration with moderately high-pitched inspiratory stridor. The neck was supple, and no mass or lymph nodes were palpable. Laryngoscopy revealed a hard smooth mass with intact mucosa, occupying the posterior third of the glottic chink. The larger portion of this mass was on the left side and partially encroached upon the left vocal cord.

10. Ryan, M. D., and Zizmor, J.: Chondroma of the Larynx, Am. J. Roentgenol. **62**:715-718 (Nov.) 1949.

11. Havens and Parkhill.[1] Clerf.[2] Link.[9]

X-ray studies (Fig. 1) revealed the presence of a tumor mass in the posterior larynx, displacing the airway anteriorly and narrowing the air passage. There were suggestive calcium deposits in the tumor mass. A barium swallow revealed no obstruction or delay, and the mucous membrane appeared normal.

Two separate attempts to remove a biopsy specimen of the tumor by direct laryngoscopy were unsuccessful. A benign tumor was suspected, but its nature remained undetermined. On April 4, thyrotomy was done to expose the tumor. It appeared to arise from the posterior ring of the cricoid cartilage and involved the left arytenoid and the first tracheal ring. The tumor was not encapsulated; hence morcellation became necessary. The tumor could not be removed in its entirety. A tracheostomy was done, with closure of the wound. Gross tissue examination revealed a specimen consisting of two parts. The first part was a piece of soft yellow-brown tissue, 8 mm. in diameter. Microscopically, it consisted of normal thyroid tissue. The second part

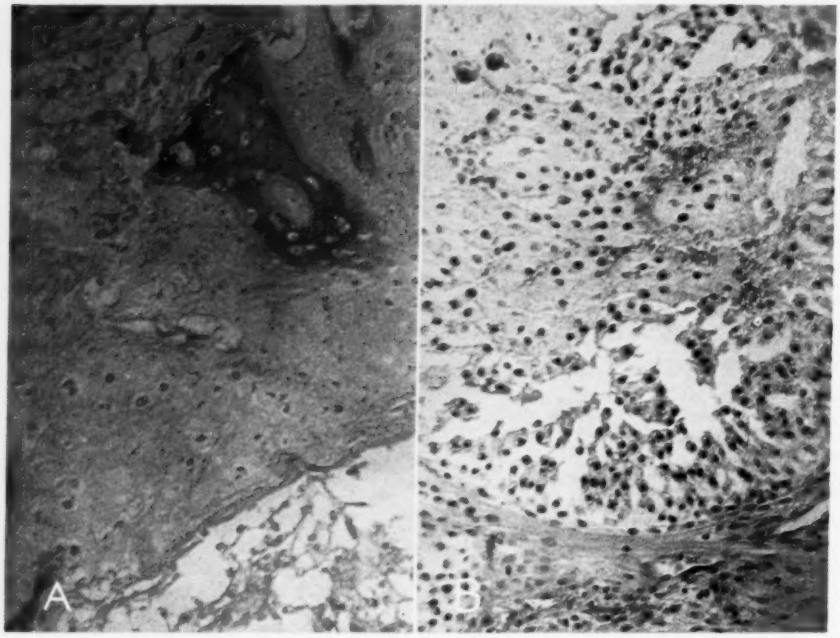

Fig. 2.—*A*, microscopic section of biopsy specimen from tumor of larynx, showing relatively mature cartilage and a focus of ossification. *B*, microscopic section from resected larynx, showing highly cellular chondrosarcoma.

consisted of six small, 3 to 5 mm., pieces of gray and red soft tissue, to which small bits of bony tisue were attached. Microscopically, they consisted of mature-appearing cartilage in which small numbers of well-differentiated chondrocytes were scattered through an acidophilic matrix (Fig. 2*A*). One surface was covered by squamous mucosa. In the subepithelial tissue there were well-differentiated mucous glands, mature cartilage, and a mild chronic inflammatory exudate. Diagnosis was chondroma of the larynx, which was confirmed by the Armed Forces Institute of Pathology. The patient was discharged at his request because of business commitments.

He returned in September, 1951, with practically no voice and entirely dependent on his tracheostomy for an airway. The tumor had grown at an accelerated rate, involving both cords and almost completely occluding the glottis. At operation a laryngofissure was performed at first and revealed such marked extension of the lesion that its complete removal could be accomplished only by a total laryngectomy. A portion of involved thyroid gland on the right side

was removed with the specimen. Gross tissue examination revealed a specimen consisting of a larynx, three tracheal rings, and the epiglottis. A large soft gelatinous fungating tumor was present in the larynx and trachea. It had extended to the outer edge of the cricoid cartilages without perforating the fascia covering them. On the right side the corniculate cartilage and the arytenoid muscle were invaded. Microscopically, the squamous mucosa was acutely and chronically inflamed. The submucosal tissue contained a loose eosinophilic myxomatous stroma, in some areas of which there were large irregular cells in which occasional tripolar mitoses were evident (Fig. 2*B*). Also present were large circular islands of more sharply circumscribed chondromatous tissue. These were highly cellular foci and appeared sarcomatous. The diagnosis was chondrosarcoma of the larynx, which was also confirmed by the Armed Forces Institute of Pathology. The patient made an uneventful recovery. When he was seen four months later, there was no evidence of tumor present. The patient had returned to work and was obtaining esophageal speech training.

COMMENT

The diagnosis of a cartilaginous tumor of the larynx should be considered when an area of tumefaction is seen by x-ray and when at laryngoscopic examination a subglottic lesion proves difficult to subject to biopsy because of its gritty nature. The treatment of chondral tumors is the same wherever they are found. The general surgeon has learned to excise these tumors with a wide margin to avoid a high rate of recurrence. In a similar fashion, the laryngologist must plan the complete removal of these tumors when they are found in the larynx. Since the chondromas are slow-growing and usually only locally invasive, the chances for a cure after radical excision are good. It is quite possible that the original biopsy specimen in this case may not have been truly representative and that the existence of a chondrosarcoma at that time cannot be denied.

SUMMARY

A case of chondrosarcoma of the larynx treated by total laryngectomy is reported.

Radical extirpation, as the primary operation, of cartilaginous tumors, whether they are chondromas or chondrosarcomas, is emphasized as the procedure of choice.

Progress in Otolaryngology

Summaries of Bibliographic Material Available in the Field of Otolaryngology for 1950-1951

PHYSIOLOGY OF THE EAR

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SECONDI [1] studied the structure of the membrana tympani in 10 specimens each of a number of animals, including dogs, cats, oxen, sheep, pigs, and horses. He compares his findings with those of Fumagalli in man. The latter stated that in man the bundles of collagenous fibers making up the lamina propria of the tympanic membrane are disposed in such a way that their tension does not change with increasing or decreasing tension of the tympanic membrane itself. In man there has been demonstrated on the cone of radial bundles a system of parabolic bundles originating from the short process of the malleus. These fan out anteriorly and posteriorly from the short process of the malleus and end in the fibrous ring under the arch of a crescentic bundle. These two bundles Fumagalli named the parabolic-crescentic system. This system is in balance with the radial bundles. With different positions of the malleus, the degree of their bending will change but not their tension.

Secondi studied in his animals the shape of the tympanic membrane, the character of the radial fibers, and the structure of the parabolic fibers. The shape of the membrane is that of a pseudocone with the apical angle differing in various species. The apex—the umbo of the membrane—is more or less eccentric in relation to the circumference of the membrane. A direct ratio exists between the eccentricity of the malleus handle and umbo on one side and the obliquity of the axis of rotation of the ossicular chain on the other. Some authors attribute peculiar acoustic significance to this fact. The radial fibers in all species were found to originate from the malleus handle, but their disposition is different in the various species. In the guinea pig, the fibers are uniform in their whole course and are stiff and coarse. In the rabbit the fibers are grouped in thin, independent bundles and show a disposition similar to that in man. In all other species studied, the fibers are woven into a dense plexus. Thus, the lamina propria becomes a solidly built membrane and the radial fibers lose their identity. In this solid layer are found triangular clefts from the periphery to the handle of the malleus.

In the guinea pig, rat, and rabbit the parabolic fibers are arranged in a similar fashion to that in man. No crescentic bundle, as it appears in man, could be discerned. The horse shows the parabolic as well as the crescentic bundles. In sheep, ox, and pig only parabolic bundles are seen, and they are thicker than those in man or the horse.

1. Secondi, U.: Structure and Function of the Lamina Propria of the Tympanic Membrane in Various Mammals, A. M. A. Arch. Otolaryng. **53**:170 (Feb.) 1951.

Secondi concludes from his studies that the different lengths of the radial bundles depend on the topographic and mechanical conditions and not on the acoustic needs. The structure of the radial fibers within the lamina propria has a double advantage from the mechanical standpoint. The fibers of the small bundles being independent of each other, the texture of the membrane can undergo strong deformation without appearance of folds or wrinkles at the points of uneven displacement. Where the tympanic surface is wider, where a greater stiffness of the surface is needed, the structure with isolated bundles is not sufficient. In this case, the bundles build a matted plexus perforated by clefts placed in such a manner that the cone of the membrane (its usual shape) can be deformed with relative ease and no wrinkles are formed on its surface. The parabolic fibers with their types of distribution have been assigned a tentative function: They form loops which cannot be stretched—they are fixed with one end to the malleus and the other to the periphery of the membrane. Thus, they follow a position assumed by the long process of the malleus and are displaced as a whole toward the base or toward the periphery of the cone. The entire membrane, as a result of the fiber arrangements, can be stretched uniformly. It can change its shape while maintaining a certain degree of stiffness and can vibrate as a whole like the dynamic cone of a loud-speaker. The value of these studies is summarized by the author as follows:

> The disposition of the radial and parabolic fibers plays an important role in relation to the mechanical properties of the tympanic membrane. This membrane, on the basis of its structure, can change its shape as well as its degree of tension, but this ability does not modify the tension of the collagenous fibers of the membrane. Since the tension of the fibers is constant, the mechanical properties of the membrane remain always unchanged.

Lawrence[2] points out the interesting situation of the hair cells in the cochlea floating between two membranes in a nutrient fluid. It can carry out its metabolic processes without disturbance. The hair cells respond to vibrations of the basilar membrane which squeeze them against the tectorial membrane. There is difficulty when sound is carried from an air medium to the fluid medium. The middle ear is admirably constructed for the purpose and carries sound from an air medium to the fluid medium without much loss of the sound energy. It is pointed out that this accomplishment has been difficult for audioengineers in fields like submarine detection. The author carried out experimental studies which revolved around three basic functions: (*a*) the matching of the properties of air to those of perilymph, (*b*) the transmission of periodic vibrations with a minimum of alteration in their form, and (*c*) the provision of a protective mechanism for the prevention of damage to the inner ear structure. This is essential to an analysis of auditory loss due to conductive impairment.

When the middle ear structures are removed, there is a 30-db. loss in the transmission of sound to the perilymph. The author has shown this by experiments on the cat by means of electrodes attached to the external canal, the oval window, or the round window. The responses are studied by instruments recording the electrical potentials in the cochlea. The mechanical advantage of the size of the tympanic membrane in relation to the oval window opening, the leverage of the ossicles, and the control of the ossicular chain by the two muscles are all important. They

2. Lawrence, M.: Recent Investigations of Sound Conduction: I. The Normal Ear, Ann. Otol. Rhin. & Laryng. **59**:1020 (Dec.) 1950.

overcome the impedance encountered when sound waves are transmitted from air to a denser medium like the perilymph. The oval window and the round window can carry sound into the inner ear fluid with about equal effectiveness. When these windows are acted upon equally at the same time, they are said to be in phase, and the effectiveness of one neutralizes that of the other. When the windows are out of phase, that is, when a sound goes into one and out of the other, the perception of this sound pressure is most effective. In considering the ossicular chain as a transformer system of sound from air to a liquid medium, the effect on the various sounds by the ossicular structure itself is important. The author studied in the cat various situations in the ossicular chain and recorded the effect. The mass, stiffness, and resistance at various points are the important factors in the transmission of sounds of various frequencies. The characteristic frequency of the chain itself is also a factor to be considered. The system appears to be admirably suited to transmission of sound without distortion. Any change in these factors which may be brought about by pathology would, therefore, have much influence on the transmission of sound.

The author summarizes his work somewhat as follows: The middle ear has the function of matching the impedance of the air to that of the cochlear fluids. Without the middle ear structure there would be a loss of 30 db. in the transfer of sound energy. The ossicular chain is a fine mechanical arrangement for the transforming of this sound energy. It is remarkable that this is done without the middle ear structures exerting any appreciable influence by their own mass on the sound changes. The natural frequency of the chain lies in the middle of the audible range, a factor which provides maximum sensitivity in this region. The system is highly damped to make the response uniform with frequency without sacrificing too much of the sensitivity.

For the proper effect of the transmission system, the inner ear fluids must be free to move. Alterations in the conductive system varying from the slightest changes in mass, stiffness, or friction to complete removal can produce an unlimited variety of audiometric pictures.

Wever [3] follows through the work of Lawrence in the second article of the series and applies the information to clinical conditions of conductive impairment. A perforated eardrum membrane may cause loss of 10 to 20 db. Loss is greater when the perforation is near the attachment to the manubrium. A perforation interferes with the stiffness of the conductive system. Interruption of the ossicular chain at the incudostapedial joint causes a loss of 60 db. When the tympanic membrane and the outer ossicles are removed, the loss is less, about 40 db. The loose ossicles interfere with transmission of sound. The loss is due, as pointed out in Lawrence's article, to interference with the stiffness of the chain, as well as to sound entering both windows at the same time, so that the effectiveness of one is neutralized by the other. The sound waves enter in "phase." Wever also states that it might be better if, after interruption of the ossicular chain, the sound could somehow be prevented from entering both windows at the same time.

[Reviewers' Comment: This calls to mind the work done a number of years ago by Walter Hughson, who reported improvement in hearing on plugging of the

3. Wever, E. G.: Recent Investigations of Sound Conduction: II. The Ear with Conductive Impairment, Ann. Otol. Rhin. & Laryng. **59**:1037 (Dec.) 1950.

round window. Also, Pohlman's artificial ear drum which finds a "sensitive spot" may be the plug to one or the other window areas.]

Fixation of the ossicles by fluid in the middle ear or adhesions has a marked influence on the transmission of sound. Here Wever cites various authors who did experimental work and reported varying degrees of impairment. The author further discusses in great detail the effect of otosclerosis in various stages upon hearing. He reports his work in cooperation with Lempert on the effects of various situations during and following the fenestration operation. This is best read in the original to appreciate fully the importance of the work.

Wever and Lawrence [4] had previously studied and measured the mechanics of the middle ear structures in terms of electrical potentials. The cat was used for this purpose. They had found an approximate loss in hearing sensitivity when the malleus and incus had been removed. This was most apparent in the middle frequencies (33 db.) and was somewhat less in the higher and lower frequencies (28 db.), an average of 30 db. These results indicated the mechanical action of the structures as a transformer and compared well with those obtained with a man-made mechanical transformer. However, these studies did not take into account the transmitting properties inherent in the structures themselves—the acoustics of the middle ear. The authors in this article report their findings in the cat, their studies of the acoustical properties of the middle ear structures. These were studied by means of phase changes in the system introduced into the vibratory motions they transmit. With the use of electrodes from the round window, microphone, amplifiers, phase shifter, and cathode-ray oscillograph, studies were made before and after removal of the middle ear structures, and the phase changes were recorded. In this study the stapes and its tendon were not considered, as they were studied by a different method and the results reported elsewhere. The authors conclude that the middle ear in the animal studied presents remarkably uniform properties to sound over a wide range of frequencies. An analysis based on electrical and mechanical "models" indicates that this uniformity is achieved by the development of two mechanical resonances separated by about two octaves and by the presence of a high degree of frictional damping. In consequence, the middle ear is able to carry out its function as a mechanical transformer with minimum disturbance of the response pattern. While the authors made this study on the cat, they feel that there is a possibility that other ears, including man's, have made adaptations of function that are as serviceable as the ones revealed in this animal.

Pursuing their recent work on the transmission properties of the middle ear, Wever and Lawrence [5] studied this function in the remaining ossicle—the stapes. A somewhat different method was used for the study, although the same principle of measuring the electric potentials of the cochlea during stimulation with sound was used. In this experiment, the stapes was carefully preserved and the other ossicles were removed. Two sound tubes were applied to the ear, one over the oval window and the other to the round window.

4. Wever, E. G., and Lawrence, M.: The Transmission Properties of the Middle Ear, Ann. Otol. Rhin. & Laryng. **59**:5 (March) 1950.

5. Wever, E. G., and Lawrence, M.: The Transmission Properties of the Stapes, Ann. Otol. Rhin. & Laryng. **59**:322 (June) 1950.

The authors' conclusions are as follows:

The experiments show that in the cat, when the drum membrane and outer ossicles are removed, the oval window and the round window routes to the cochlea present differences both of sensitivity and phase. These differences, we have reason to believe, are mainly the result of the presence of the stapes in the oval window.

The effects of this ossicle on sensitivity are slight, not exceeding 9 db. when the stapes is intact and not exceeding 4 db. when only the footplate remains, and in either case are most noticeable in the high frequencies.

The effects on phase are small over the main course of the frequency scale, and then become marked for the high frequencies. About 5000 cycles a phase lag enters and mounts rapidly to a maximum, whereupon it changes in discontinuous fashion to a phase advance. . . . The discontinuity represents a point of antiresonance and the crossing from advancing to lagging phase represents a point of resonance. The locations of these points vary somewhat as the stapes is modified by the removal of its more peripheral parts [crura].

An attempt is made to analyze the action of the stapes in the process of conduction by the use of electrical and mechanical "models."

The stapes is more sensitive to higher frequencies and the other ossicles to lower frequencies. The stapes is of some small service also for the medium-high frequencies. It is of advantage in one region and disadvantage in another. In the highest frequencies it adds complexities to the mechanical vibratory characteristics.

Contraction of the muscles in the ear has been studied previously through perforations in the eardrum membrane. Metz [6] studied the contraction of muscles to sound in both ears as resistance or impedance measured on the eardrum membrane. A sound introduced into one ear causes contraction of the muscles in both ears due to bilateral innervation of the hearing organ. This is similar to pupillary reaction when a light is directed to one pupil and makes both react. With apparatus in one ear, sound is introduced into the contralateral ear. The reaction of the tested ear as studied on an oscillogram is recorded. The author shows several diagrams, as well as curve records, under various conditions.

Jepsen,[7] using the impedance method of Metz cited above, examined 98 ears and records the lowest intensity which will cause contraction of the muscles in the ear. He used tones from 125 to 8000 cycles. The threshold curve was found to lie at about 70 to 90 db., lowest at 1000 to 2000 cycles.

Perlman [8] reviews the opinions held on the Eustachian tube mouth during swallowing and phonation and adds some of his own observations. Information about this function was obtained through anatomical dissections, observations on living animals, and observation on living human subjects either through a nasopharyngoscope or through some pathological defect in the palate. Various conflicting opinions have been recorded. It was stated that the levator and tensor palati muscles did not act to open the tube. The stylopharyngeus opened the tube during swallowing. The salpingopharyngeus muscle moved less during phonation than in swallowing, and the whole postnasal wall was elevated during swallowing. The tube was reported to open during swallowing. It was reported that by cutting

6. Metz, O.: Studies on the Contraction of the Tympanic Muscles as Indicated by the Impedance of the Ear, Acta oto-laryng. **39**:397 (Oct.) 1951.

7. Jepsen, O.: The Threshold of the Reflexes of the Intratympanic Muscles in a Normal Material Examined by Means of the Impedance Method, Acta oto-laryng. **39**:406 (Oct.) 1951.

8. Perlman, H. B.: Mouth of the Eustachian Tube: Action During Swallowing and Phonation, A. M. A. Arch. Otolaryng. **53**:353 (April) 1951.

experiments on the various muscles around the tube it was shown that the tensor palati was innervated by the 5th nerve and the levator by the 10th nerve. Reduced resistance to Valsalva experiment has also been observed after section of the fifth nerve for tic douloureux. The author continues with a number of other observations on the same topic and then presents his own work.

His own work consisted in the observation of four subjects with defects of the face, in whom the tubal area could be observed from above and was studied by moving pictures. He reports that a great deal of activity of the soft palate, as well as of the adjacent tubal area, could be observed, in phonation and swallowing. In phonation, only the posterior tip of the torus is seen to move. This movement is backward, upward, and medial as the soft palate and tube are elevated. The posterior lip appears to be lifted passively by the contracting levator and separates the edges of the tube mouth. Active movement by the simultaneously rising salpingopharyngeus also contributes to the observed additional displacement of the posterior lip in its lower portion.

In swallowing, the anterior and posterior lips of the torus actively move in opposite directions, while the soft palate is elevated and retracted laterally to include that portion forming the floor of the tube. The anterior wall of the tube enters into this anterior movement along with the torus, and the resultant opening of the mouth of the tube is greater, deeper, and rounder than on phonation. Then there is a mass anterior shift of the tube. After the initial return of the separated walls of the tube, a ridge forms in the anterior wall that momentarily narrows the lumen to less than the diameter in the resting state.

The lumen of the tube may be bridged by a mucous blanket during phonation and even during swallowing. Even when this mucus is not seen bridging the visible lumen near the mouth of the tube, one cannot determine by direct vision the condition of the tube lumen extending into the middle ear through the fixed or bone portion of the tube. Other methods than the direct inspection of the mouth of the tube, such as the study of sound transmission through the tube, are necessary to determine whether the resting tube is normally closed or open and what changes in the continuity of the air molecules in the middle ear with those at the mouth of the tube occur during physiological action. The tube lumen may be narrowed by pressure on the neck. No reflex activity of the tubal muscles could be initiated by manipulations of the ear.

Perlman[9] calls attention to the limited knowledge on the physiology of the Eustachian tube as a ventilator of the middle ear. Opening and closing of the Eustachian tube had been studied by measurements of air pressure with a manometer in the external auditory canal (Politzer) while swallowing with the nose and mouth closed (Toynbee's maneuver). A sound like a tuning-fork vibration in front of the nose heard upon swallowing has also been considered proof of a patent Eustachian tube (Politzer).

The author sets out to obtatin data on sound transmission which will signify a patent Eustachian tube and the mode of ventilation of the middle ear. He used apparatus which he previously employed in the study of the patency of the Eustachian tube. The external ear canal was connected by a properly fitted tubing to electrical

9. Perlman, H. G.: Observations on the Eustachian Tube, A. M. A. Arch. Otolaryng. **53**:370 (April) 1951.

sound-recording instruments (oscillograph, cathode-ray oscilloscope). Sounds caused by swallowing or voluntary muscle clicking with the pharyngeal muscles were carried by electrodes from the neck to the recording instruments. The author recalls the work of Békésy on sound transmission through the head on phonation. One of the points emphasized by Békésy was that the hearing of one's voice is due to bone conduction and air conduction in equal parts. The sound pressure produced in the mouth cavity contributes the same amount of loudness as that from vibrations of the vocal cords. Other details of findings are described. The author reviews the physiologic pressure changes in the nasopharynx and describes the apparatus for measuring these changes. The Eustachian tube and middle ear are exposed physiologically not only to sound pressure in the nasopharynx during phonation but also to slower pressure arising from respiration and deglutition. The pressure changes taking place at the mouth of the Eustachian tube during quiet respiration are small, and there is no associated activity of the tubal muscles at this time. The Eustachian tube remains closed to shield the middle ear from them. Even the pressure changes in the nasopharynx during forced respiration are not sufficient to open the Eustachian tube. Ordinarily, during swallowing the open state of the nose does not allow any pressure changes to develop opposite the mouth of the tube, but under conditions of nasal obstruction one may generate definite pressure changes in the nasopharynx comparable with those produced by the Toynbee maneuver (swallowing with mouth and nose closed). These pressures are created at the mouth of the tube just when the tubal muscles are contracting, tending to open the tube; hence such pressure may be transmitted to the middle ear. The author studied the activities about the Eustachian tubes, and some of his conclusions are the following: The nasopharynx is hermetically sealed from the pharynx in swallowing by the contracting soft palate. With the nose closed, a closed air cavity is produced with only one actively changing wall, that bordered by the soft palate. As the palate rises to close the nasopharynx, not only do the oropharynx and the hypopharynx enlarge, but the cricopharyngeus muscle relaxes to permit continuity of these cavities and the esophagus. Palate and tubal activities as produced in phonation are not associated with opening of the tube. Swallowing water is more effective than swallowing without water in opening the tube. The tube is closed even during swallowing. The reflex opening of the tube during swallowing is different from voluntary opening. In the former, the tube is more widely open. Other differences noted are in duration and rate of opening and closing. Many detailed observations are made, and to summarize them would mean repetition of the entire article. No excess words are used, and one interested in the subject would do well to read the material in the original article.

Ojala [10] studied 89 temporal bones of 46-year-old persons with varying types of pneumatization for the purpose of explaining the probable causes of the different results to which pneumatization has led in these cases. Ten temporal bones in infants were studied for comparison. Some of the conclusions are as follows: The air space of the middle ear, as well as the extent of preformed bone cavities, varies greatly in infants. As external influences can with great probability be ruled out in the newborn, it seems that these variations are due to constitutional factors. Advanced

10. Ojala, L.: Contribution to the Physiology and Pathology of Mastoid Air Cell Formation: Histological Studies of Aged Individuals and Newborn Infants, Acta oto-laryng., Supp. 86, p. 1, 1950.

age does not produce any characteristic type of pneumatization. Inflammatory processes generally cause only focal destruction of air cells. Sclerosis of the mastoid process is attributed to frequently recurring or chronic otitic infections. General mastoid sclerosis probably arises only on the basis of primary arrest of pneumatization, as stated by Wittmack. This is caused by pathological changes in the mucous membrane resulting from otitis in infancy.

The author summarizes the physiological course of pneumatization as follows: Preformation of bone cavities takes place by means of osteoclastic activity of the periosteum. The intensity of the process varies individually and is obviously due to constitutional factors. Its purpose is to change the tissues adjoining the air space into homogeneous tissue of periosteal origin where this is possible without endangering the static-dynamic requirements of strength. As this combination of tissues has no longer any definite function, it begins to atrophy and contract. In the open marrow spaces this process leads to the disappearance of free marrow elements. The remaining edematous marrow reticulum resembles embryonal connective tissue in structure. Air-cell formation continues at a rate varying in different persons and so results in varying types of extent and structure. In the absence of any disturbance it is probable that the whole available bone mass of the mastoid process nevertheless becomes pneumatic.

The basic requirement for air-cell formation is that the pressure in the growing air space remains continually equal to the tissue pressure. Maintenance of the equality of pressure is essential. It is of no consequence whether this is achieved by the aid of air or amniotic fluid. However, it cannot be possible that mechanical factors are the primary cause of mastoid pneumatization; they can be only a requisite for this purpose.

The author also discusses his differences in interpretation of the various processes which go on from that of Wittmack and notes some clinical conditions of practical value resulting from the knowledge of what takes place. For instance, the hyperplastic changes, the causes of chronicity, and adhesive processes are discussed. The value of early paracentesis in otitis media in infancy and of Politzerization following any paracentesis is discussed.

Altmann and Waltner [11] follow up a previous report of a preliminary study on the flow of labyrinthine fluids. They used the method of Weed. They introduced iron salts (iron ammonium citrate and potassium ferrocyanide) of various concentrations into the subarachnoid space and shortly thereafter fixed the temporal bones in formalin-hydrochloric acid solution. The iron salts form a precipitate of Prussian blue granules with the hydrochloric acid and can thus be traced into the various parts of the labyrinth. The animals employed were rabbits, cats, and monkeys.

In rabbits, a 5% solution of the iron salts was more effective than the smaller concentrations. The pattern of the spread of the granules was up to the helicotrema after the granules once entered the scala tympani, then went downward into the scala vestibuli. Some of the granules spread from the scala tympani lateralward into the stroma of the spiral ligament and into the venules. Some spread through the basilar membrane into the cochlear duct and into the various spaces between the cells of the

11. Altmann, F., and Waltner, J. G.: New Investigations on the Physiology of the Labyrinthine Fluids, Laryngoscope **60**:727 (Aug.) 1950; Further Investigations on the Physiology of the Labyrinthine Fluids, Ann. Otol. Rhin. & Laryng. **59**:657 (Sept.) 1950.

organ of Corti. They were also traced medialward to the lamina spiralis, perineural spaces, and spiral ganglia. From the scala vestibuli the granules traveled into the cochlear duct through Reissner's membrane. In addition, it was found that, through a circumscribed area of the dura, the granules could be traced from the arachnoid space into the sac and from there into the blood vessels. The spread of the granules from the perilymphatic spaces into the vessels suggests resorption in that area. The spread of the granules through the interscalar septa into the modiolus occurs not in the vessels but in the perivascular spaces.

In cats, the material was injected through the bulla directly into the scala tympani. Some of this fluid went readily into the aquaeductus cochleae and back into the subarachnoid space. This reverse flow suggests a simple diffusion or an increased pressure within the scala. The rest of the penetrations were similar to that in the rabbits, although with differences in quantities.

In monkeys the same penetration took place but was much less into the cochlear duct, probably because of the greater length and narrowness of the aquaeductus cochleae.

From their studies, the authors conclude that the origin of the perilymph as well as the endolymph is in the vessels of each respective cavity. The assumption that there is a special fluid current from the arachnoid space is unnecessary. Judging from the spread of the salt particles in the inner ear fluids, they follow the pattern of physiochemical factors plus other biological factors responsible for changes in certain areas where resorption takes place into the tissue spaces. From there the salts can be traced into the blood vessels or into the spaces which surround the modiolar vessels, then into the fundus of the internal auditory meatus. The main resorption takes place from the cochlear duct and to less extent through the scalae. The free permeability of the basilar membrane and Reissner's membrane is of help. The spread of the salts within the scala tympani up to the helicotrema and down to the scala vestibuli seems partly controlled by a fluid movement and a large-scale penetration through the basilar membrane. This is similar to the movement controlling the production and resorption of cerebrospinal fluid. The experiments also show that any current from the cochlea to the endolymphatic sac is of little significance for low molecular substances in physiological concentration from the cochlea.

If sufficient amounts of the salts reach the vestibule, they spread from there to the perilymphatic spaces of the semicircular canals and eventually into the blood vessels of the trabecula of the perilymphatic tissue. In high concentrations, the salts spread along the perineural and perivascular spaces in either direction toward the maculae and cristae and into the fundus of the internal meatus. The findings indicate that actual resorption of the perilymphatic fluids takes place mainly in three areas: from both scalae into the spiral ligament, and from the vestibule and semicircular canals into the blood vessels in the trabecula of the perilymphatic tissue.

The resorptive mechanism of the cochlea seems more than sufficient for the disposal of low molecular substances in physiological concentrations. Resorption of the endolymph from a certain part of the endolymphatic sac seems to indicate a slow fluid current toward the sac. This current affects mainly those substances which are difficult for resorption by the regular cochlear mechanism and are carried to the sac.

Waltner and Raymond [12] contribute to the study of the composition of the inner ear fluids. The prevailing conception that the perilymph is fluid derived from the cerebrospinal fluid coming in through the aquaeductus cochleae is not tenable in view of the differences in the content of some important components. The authors point to studies reported previously by one of them (reviewed in this article) that showed the likelihood of existence of a membranous structure at the cochlear ending of the aqueduct which seems to act as a barrier separating the perilymph from the spinal fluid. In these studies it was shown that the fluid is formed and resorbed within the inner ear.

In the present study, several specimens of perilymph were obtained during a Day operation. One specimen of endolymph was obtained while tearing the sac in a Portmann operation. The specimens were studied for ultraviolet absorption in the spectrum and also for total nitrogen. Certain conclusions were drawn from these measurements. The authors found that the protein content of perilymph and endolymph as measured in the spectrum by D 275 (ultraviolet absorption) was more than twice that of the spinal fluid of the same patients. Total nitrogen findings confirmed a difference detected in the spectrum. On measurement the sodium content in the spinal fluid and in the inner ear fluids was identical. This seems to confirm the previous findings of a barrier membrane in the aqueduct which does not permit passage of large molecules of colloids like protein. The passage of sodium points strongly to the semipermeable nature of the membrane.

The authors have one reservation in mind, and that is whether these findings are applicable to normal perilymph, since their specimens were collected from persons with Ménière's disease.

Lempert [13] uses three methods of testing the hearing function. He uses pure-tone audiometry with carefully checked audiometers, steel tuning forks, principally 512, and tests with a number of meaningless words to avoid the use of words which the patient hears in his own language and which he may thus estimate from part hearing instead of pure hearing.

Engström and Hjorth [14] briefly review the work on the formation of perilabyrinthine and endolabyrinthine fluid. They refer to the fundamental work of Guild, who injected mixtures of ferrocyanide and iron ammonium citrate into the cochlear duct and traced its distribution. They also cite other investigators, Weed, Quix, V. Egmond, Yamakawa, Altmann, Waltner, and Anderson, and present some of their own experiments on a number of guinea pigs. The authors employed many test animals, including more than 100 guinea pigs, into which they injected several dyes, including trypan blue by various routes. They employed the intraperitoneal, intravenous, middle ear, round window, and cochlear duct routes and discuss in detail the distribution of the dyes in the inner ear. They present nine photomicrographs demonstrating the distribution of the granules. They

12. Waltner, J. G., and Raymond, S.: On the Chemical Composition of the Human Perilymph and Endolymph, Laryngoscope **40**:912 (Sept.) 1950.

13. Lempert, J.: Practical Testing for Pure Physiological Hearing Function, Laryngoscope **60**:344 (April) 1950.

14. Engström, H., and Hjorth, S.: On the Distribution and Localization of Injected Dyes in the Labyrinth of the Guinea-Pig, Acta oto-laryng., Supp. 95, p. 149, 1951.

conclude that the endolymphatic sac with its intrasaccular cells constitutes an important structure for the resorption of injected dyes. No other part of the head has such an affinity for the injected dyes as has the endolymphatic sac. The major part of the trypan blue granules is localized in the intrasaccular cells and the rugose portion of the sac. A smaller amount is also found in the proximal and distal parts. An even smaller accumulation of the granules can be found in the perivascular and endosteal connective tissue. A few granules appear in the cochlear wall. The perisaccular tissue contains several histiocytes which take up trypan blue granules.

Arnvig [15] reviews the work previously done by many investigators on the communication of the cochlear aqueduct in animals and man. These represent studies on interchange of fluid and on effect on labyrinthine pressure by cerebrospinal fluid, as well as pathological states resulting from those factors. He mentions particularly J. Fisher's work concerning pathological changes in the inner ear in man induced by intracranial pressure. He also mentions a report (Josephson) of a case in which impaired hearing improved considerably after lumbar encephalography and in which it was also claimed that air was visible in the inner ear.

Arnvig made some preliminary experiments on guinea pigs to determine the effect of chronic intracranial pressure on the labyrinth by injecting a small amount of melted paraffin intradurally. He examined the animal which survived 25 days and two months afterward. An experiment with acute intracranial pressure was also performed by injecting 2 cc. of Ringer's solution very rapidly into the cerebellomedullary cistern. In neither instance was there any influence on the labyrinth. The labyrinths of guinea pigs seem well protected against intracranial pressure.

His main experiments consisted of injecting into the subarachnoid space India ink with killed bacteria. This was to allow him to study the flow of the material into the labyrinth, which was studied histologically; at the same time the clogging of the outflow of the cerebrospinal fluid through its usual channels afforded an opportunity to study the effect of intracranial pressure on the labyrinth.

The results of the experiments indicate that the perilymph moves in the scala tympani toward the apex and in the scala vestibuli toward the base. The flow in the aquaeductus cochleae is comparatively slow. The perilymph is absorbed in the spiral ligament. There seems to be an exchange of the substance between the organ of Corti and the spiral ligament through a space (Peterfi space). The perilymph may be absorbed from the scala tympani along the spiral nerve running to the spiral ganglion. The morphology of the India ink particles in the saccus endolymphaticus points to this organ as having an absorptive function. Some ink found in the saccule suggests a secretory function in the organ. There is a communication between the subarachnoid space and the mucous membrane of the middle ear through the perivascular sheath, also through a network in the aqueaductus cochleae extending to the middle ear in the region of the niche of the round window. No demonstrable histological changes could be detected in the labyrinth as a result of the acute or chronic intracranial pressure.

15. Arnvig, J.: Relation of the Ear to the Subarachnoid Space and Absorption of the Labyrinthine Fluid, Acta oto-laryng., Supp. 96, p. 1, 1951.

Perlman,[16] using methods of Békésy, has studied the cochlear mechanism through fenestra at various parts of the cochlea. He states that concepts of the physical phenomena of the cochlea during acoustic stimulation have been based on the study of anatomy, particularly microscopic studies. Bioelectric and psychological phenomena have also been used as a base for interpretation of cochlear mechanism. The separation of the physical from the neural phenomena in the cochlea is still obscure. The solution of this problem is important.

He further calls attention to the fact that direct observation of the cochlea during acoustic stimulation is absent. He cites Békésy and describes the latter's methods in some detail. Békésy contributed most of what is known about the physical properties of the cochlea and its reactions to stimuli.

Perlman has used three methods employing fresh cadaver temporal bones (of the newborn) and also some animals. These bones are known to be acoustically active. With proper handling, the use of dental drills, constant irrigation with Ringer's solution, and a dissecting microscope, fenestras can be made in various parts of the bony cochlea. The cochlear duct can be inspected, probed with fine hairs or metal probes, and moved about, and its reactions to acoustic stimuli can be observed.

Fenestras have been made in the basal, middle, and apical coils of the cochlea for study. Fine probes, hooks similar to those used in fenestration surgery, were employed.

Reissner's membrane can be torn away and the interior of the cochlear duct studied. The tectorial membrane is easily visualized and was found to be adherent to the hair cells below it. The tectorial membrane can be lifted from these cells as it is quite resistant to tearing.

When the tectorial membrane is depressed, an elongated hollow depression occurs, in contrast to other surfaces which exhibit a circular depression. It also exhibits a different elasticity in transverse direction from that in the long direction. It is stiffer lengthwise.

These observations and those on the other structures to be mentioned are in keeping with those of Békésy, who first studied the volume elasticity of the basilar membrane and the cochlear duct and found that the elastic component of the mechanical impedance of the basilar membrane varied from apex to base by a fractor of about 100:1. The term mechanical impedance refers to the fact that any structure will offer mechanical impedance to vibration. This impedance is due to three fundamental properties: mass, elasticity, and friction. When a driving force acts to set a structure into vibration, forces which tend to resist the motion result from three fundamental properties which are, respectively: (*a*) an inertia force due to mass, (*b*) a stiffness due to elasticity, and (*c*) a resistance force due to friction. The effects of these three properties are combined mathematically into a single quantity, known as the mechanical impedance to vibration. The amplitude of vibration is directly proportional to the amplitude of the driving force but is inversely proportional to the mechanical impedance.

The basilar membrane can also be depressed with a fine hair or probe and its elasticity judged. It deforms to pressure longitudinally. By using a hair of

16. Perlman, H. B.: Observations Through Cochlear Fenestra, Laryngoscope **60**:77 (Jan.) 1950.

graduated stiffness and a constant pressure of 1 cm. of water, a quantitative estimation of its elasticity may be made. Movement of the membrane initiated by acoustic stimuli disappears rapidly, suggesting much damping. The membrane is stiffer at the basilar (shorter) end than at the apical (wider) end.

Reissner's membrane has a greatly reduced resistance to pressure. To facilitate observation, silver crystals placed in the perilymph as reflectors of light are used. Strongly reflected light, as well as stroboscopic light, a stereoscopic microscope with water-immersion lens, and a proper acoustic stimulus must be used. The latter requires a loud-speaker activated by a Hewitt Packard audio-oscillator with a suitable amplifier.

During the experiments the great amount of activity observed in the fluids and membranous cochlea in response to acoustic stimuli was striking. Known laws of fluid mechanics enter into the explanation of the visible activity, such as eddy currents.

The following are some of the interesting facts observed with acoustic stimulation: The cochlea vibrates at right angles to the scalae and Reissner's membrane vibrates with the basilar membrane. The cochlear fluids at low frequencies (15 cps) move parallel to the scalae. As the frequency of the sound is increased, right-angled movements of the cochlear partition are observed with greatest amplitude at the apex. With further increase, above about 400 cps, the apex comes to rest. Reissner's membrane appears to move outward as a static displacement into the scala vestibuli while vibrating acoustically. This is true of the tectorial membrane while still attached or when partially loosened from the underlying cells. The tectorial membrane can be torn off the underlying cells by large acoustic stimuli (traumatic effect of loud noises). Békésy found a definite frequency distribution along the basilar membrane for frequencies between 25 and 2,000 cps. Here there was a flat frequency response rather than a sharply peaked response to a very narrow frequency band.

There are a number of other facts elicited by these remarkable experiments in which the cochlea was actually seen in action. Also one cannot refrain from thinking how remarkably accurate the older observers were who lacked these modern facilities and depended on clinical observation and histological examination.

Gisselsson [17] in an excellent article reports experimental work on the probable method by which the cochlea converts sound energy, which is mechanical, into electrical energy. He was particularly interested in determining the presence of a chemical mediator, like acetylcholine, which could explain this conversion of energy. There has been very little of this work reported.

He found the perilymph from the pigeon, guinea pig, and cat to be capable of breaking down relatively large quantities of acetylcholine. He also believes that the endolymph from the cod, guinea pig, and the cat must contain some enzyme capable of breaking down acetylcholine, because when endolymph from the cod was added to a solution of acetylcholine there occurred an acidification of the mixture. The acidification was inhibited when physostigmine was added beforehand to the mixture. The experiments with endolymph from the cat showed that

17. Gisselsson, L.: Experimental Investigation into the Problem of Humoral Transmission in the Cochlea, Acta oto-laryng., Supp. 82, p. 1, 1950.

this labyrinthine fluid splits up acetylcholine more rapidly than does perilymph from the same animal. The amount of acetylcholine capable of being broken down by 0.001 ml. of endolymph is about 1 y per 20 minutes at a temperature of 25 C. The author could not verify Martini's work on formation of an acetylcholine-like substance by sound stimulation.

The author describes some electrophysiological studies. As attempts to record the action potentials from single nerve fibers only demonstrated the technical difficulties of this undertaking, a record was made of the cochlear potentials. Earlier studies by this author showed that physostigmine has no effect on the voltage of cochlear potentials. This is, however, not incompatible with a presumed participation of acetylcholine in the transduction of energy in the cochlea. On the other hand, however, substances possessing an inhibitory effect on acetylcholine esterase might be expected to have an effect on the latency of cochlear potentials. Whether this is so has never been examined experimentally. A method for recording changes in the latency of the cochlear potentials was, therefore, devised.

With the aid of this method it was possible continuously to follow fluctuations in latency of the cochlear potentials. The experiments performed show that physostigmine is capable of producing a considerable prolongation of the latency of cochlear potentials. Of the substances used in the experiments physostigmine had the greatest retarding effect on the latency of the cochlear potentials. Neither physostigmine nor neostigmine (prostigmin®) prolonged any effect on the latency of the cochlear potentials in atropinized animals.

The fall in blood pressure was found to reduce the voltage of cochlear potentials but to have only a slight or insignificant effect on their latency.

Epinephrine, arterenol, histamine, and atropine produced no definite effect on the latency of the cochlear potentials.

The experiments showed the presence of a quantity of acetylcholine in the endolymph of the same order as in other parts where there is a humoral transmission with the aid of acetylcholine. If acetylcholine is the stimulus of the ending of the auditory nerve in the cochlea, the liberation of acetylcholine should presumably be demonstrable. This was not possible because there is probable tonal discrimination in the cochlea, and, therefore, the quantities of liberated acetylcholine must be so minute that the methods of today are too crude to demonstrate it. The fact that substances possessing an inhibitory effect on acetylcholine esterase and (if such a substance has been injected into the animal beforehand) acetylcholine are the only drugs tested which seem to be capable of affecting the time it takes for the transduction of sound waves in the cochlea into electrical potentials, argues for the participation of acetylcholine in this transduction.

Of no less interest in this article is the author's lucid discussion of the various theories of hearing in the introduction to his work.

Huizinga and associates [18] report further work on the labyrinth of pigeons in which it is shown that there is sound perception in the labyrinth even after extirpation of the cochlea. This has been found in the canals when the crista is intact,

18. Huizinga, E.; de Vreis, H., and Vrolijk, J. M.: Analysis of the Microphonic Activity of the Labyrinth of the Pigeon into the Contributions of the Various Parts, Acta oto-laryng **39**:372 (Oct.) 1951.

as well as in the utricle and probably the saccule. Their findings are based on the Tullio reaction (when a small hole is drilled in the semicircular canal, sound will make the pigeon tilt the head in the plane of the canal) and on microphonic electrical reactions. These will not occur when the crista or utricle is extirpated.

Neff [19] reports experimental work on cats on localization of sound in space and frequency discrimination. He emphasizes the importance of psychophysiological approach—behavioral responses to sound stimuli. The author cites Woolsey and Walzl, who outlined auditory areas in cats and dogs by electrical stimulation of exposed areas of nerve endings along the lamina spiralis and recorded the electrical potentials evoked in the cortex. Tunturi is also cited as having performed similar experiments on dogs, but he used sound stimuli instead of electrical stimulation. These experiments on dogs, in which sounds of different frequencies were used, indicate the role of the cortex in discriminating frequency changes. Neff, on the basis of his experiments, rejects the theory that the auditory areas in the cat are essential to frequency discrimination. His experiments consisted in training cats to respond to sound-frequency changes; he then ablated the cortical auditory areas and noted the effect of ablation. His animals were trained to avoid shock which appeared at certain frequencies. One cat was able to relearn frequency discrimination after ablation of the auditory areas on both sides. One cat was trained by his method preoperatively; this cat was able to perform the same postoperatively as before ablation.

Experiments on sound localization were also performed by the behavioral method. Cats were trained to go to certain boxes for food by means of a buzzer. The angle between successive positions from a starting cage could be measured from 180 to 0 degrees. No change in ability to localize was found after unilateral ablation of auditory areas. Bilateral ablation did make a marked change in the animal's performance. Normal animals were able to make correct discriminations with an angle as small as 5 degrees. Animals with ablated cortex reached the same criterion only for angles of 40 degrees or greater. The behavior in animals operated on was also more variable. The author concludes that the cortex is not essential for discrimination of sound in space but is necessary for most effective utilization of sound cues in guiding such behavior.

Fernández [20] studied the distribution of the nerve fibers in the cochlea of the guinea pig. He describes two classes of fibers—the radial, which run directly from the spiral lamina, and the spiral, which run some distance in both directions of the organ of Corti. The radial fibers innervate one, two, or at most three hair cells and form the chief nerve supply of the inner hair cells. Only few are seen in the outer hair cells, and their cell bodies are in the spiral lamina. The spiral fibers innervate the outer hair cells and run up several millimeters and innervate many outer hair cells. They do not innervate every fiber in their course but skip some on the way. The radial fibers are afferent with the cell bodies in the spiral lamina; the spiral fibers seem to be efferent, and their cell bodies lie in the medulla in the superior olivary nucleus on the opposite side.

19. Neff, W. D.: Neural Mechanisms of Hearing: Some Experimental Studies of the Auditory Nervous System, Laryngoscope **61**:289 (April) 1951.

20. Fernández, C.: The Innervation of the Cochlea (Guinea Pig), Laryngoscope **61**:1152 (Dec.) 1951.

Nachlas and Lurie [21] review the literature and report some of their own observations on the stria vascularis. They could not find in the literature any constant abnormality in the stria which could account for known clinical entities. In their own specimens with inherited changes, abnormalities in the organ of Corti were accompanied with changes in the stria, whereas changes in the stria were not necessarily accompanied with changes in the organ of Corti. In acoustic trauma the organ of Corti may be destroyed and the stria have a normal appearance.

Vilstrup [22] refers to the insufficient knowledge concerning the structure of the functioning part of the crista ampullaris. He contributes toward this study. An investigation of the development of the cristae and maculae was made which should throw light on their structure and function.

He studied the histogenesis in a group of fetuses of sharks and followed the development of the cupula from the sensory epithelium of the crista. He summarized his detailed work as follows: From both layers of cells in the sensory epithelium, long cytoplasmic-columns are extended out into the lumen, and later the formation of a syncytium-like network occurs. After intranuclear structural changes, such as differences in shape, like strings of beads, horseshoes, and peg formation, the nuclear mass migrates out into this network. The nuclear mass emigrates in the form of peg-like chromatin bodies without structures. When it has become free of the sensory epithelium, it resumes its roundish-oval form. These demonstrated the intimate connection between the cupula and the sensory cells which makes it possible to understand the cupula structure in adult animals and to get a better idea of the mechanism in the response of the sensory epithelium to stimulation. This is described in the next paper.

In this paper, Vilstrup [23] continues the study of the structure of the cupula in the adult animals, and describes a few supplementary and controlling experiments performed on living animals. The study was done on freshly extirpated cod ampullae treated by the Altmann-Gersh freezing-drying method. The authors were able to demonstrate at the site of the ampullary cupula. This structure is the same in all specimens, subject to regular variation in the different phases of deflection of the cupula. A cupular zone contains a nucleated syncytial reticulum in intimate connection with the sensory cells. The author believes that the peripheral fibrillary part of the cupula serves entirely mechanical purposes and that its deflection elicits such changes in the subcupular zone as result in altered nerve action potentials. The subcupular zone is taken to be a projecting part of the sensory epithelium itself.

In collaboration with Dohlman, it is pointed out that the motion of the cupula appears chiefly to take place as a sliding (on the border between the two cupular zones) while deflection takes place but to less degree.

Glorig and his co-worker [24] describe a method of measuring nystagmus which could be applied clinically. They use the alternate hot and cold caloric tests, care-

21. Nachlas, N. E., and Lurie, M. H.: The Stria Vascularis: Review and Observations, Laryngoscope **61**:989 (Oct.) 1951.

22. Vilstrup, T.: Studies on the Histogenesis of the Ampullary Cupula, Ann. Otol. Rhin. & Laryng. **59**:19 (March) 1950.

23. Vilstrup, T.: Studies on the Completed Structure and Mechanism of the Cupula, Ann. Otol. Rhin. & Laryng. **59**:46 (March) 1950.

24. Glorig, A., and Mauro, A.: Clinical Electronystagmography, Ann. Otol. Rhin. & Laryng. **59**:146 (March) 1950.

fully controlled to produce nystagmus. The electrocardiograph is used to make the record with an electrode placed at each outer canthus. The proper detailed circuit with the addition of a booster or preamplifier is described. Its value lies in the fact that a permanent record can be made to indicate the types of wave, frequency, time, and duration of nystagmus in various patients. The status of the labyrinth may thus be determined. The authors arranged this study to record the effect of streptomycin therapy on the labyrinth.

Jongkees [25] reports a case in which the membranous horizontal seimcircular canal was accidentally damaged during a fenestration operation. However, in spite of this the patient improved in hearing in the side operated on as well as in that not operated on. When Jongkees later performed the caloric test in his customary manner, using 50 cc. of cold water and 50 cc. of hot water, he found a nystagmus to the cold caloric test with the head back but no reaction when the head was tilted forward. In the latter position, one normally expects a nystagmus in the reverse direction. When he employed the hot water, there was hardly any response. This confirms the author's previous claim that in order to consider a canal normal it should respond equally to hot and cold caloric stimulation. In this case the appearance of any nystagmus is probably explained as of vestibular origin, e. g., vascular reaction, stimulation of sensory nerves in the external auditory cavity, or reflex from otoliths or vertical canals. A remaining intact cupula could also be an explanation. At any rate, the author contends that a canal to be regarded as normal must respond to hot and cold caloric stimuli.

De Vries [26] studied the displacements of the otoliths in fishes by making x-ray photographs of the displacement and using the figures to calculate by mechanical and mathematical formulae the amount of displacement. The displacement by gravitational force was 0.1 mm. in the sacculus otolith and about 0.005 mm. for the utricle and lagena otoliths. For all otoliths the displacement by a force of 1 dyne is about 0.006 mm. The response to centrifugal force and vibration was also recorded, as well as the coefficient of internal friction.

Jongkees [27] reports experiments on the sacculus in rabbits from which the following points are suggested: The destruction of one or two sacculi does not alter the normal vestibular reactions in rabbits. They sit and move normally, and thermal and rotating stimuli result in normal reactions. Reactions to linear accelerations directed from one ear to the other are diminished after destruction of the sacculi. This is proved by experiments of the parallel swing and the centrifuge. Reactions to linear accelerations from one ear to the other are much stronger than normal when a steel ball brought into the vestibule without destruction of the sacculus is pushed toward saccular macula. Magnetic influence results in the same phenomena. Increased pressure on the saccular macula causes movements which tend to decrease this pressure. The sacculus has a vestibular function and reacts to linear acceleration acting from one ear to the other.

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25. Jongkees, L. B. W.: On the Function of the Labyrinth After Destruction of the Horizontal Canal, Acta oto-laryng. **38**:505 (Dec.) 1950.

26. de Vries, H. L.: The Mechanics of the Labyrinth Otoliths, Acta oto-laryng. **38**:262 (June) 1950.

27. Jongkees, L. B. W.: On the Function of the Saccule, Acta oto-laryng. **38**:18 (Feb.) 1950.

Jongkees and Hulk [28] studied the effect of rotation on eye movements in the turning room of their clinic. They conclude that stimulation of a semicircular canal causes movement of the eyes in the direction of the canal (law of Flourens). The misquotation that each canal causes a nystagmus in its own plane is not true. The form of a nystagmus depends not only on the axis of rotation in relation to the position of the body but also on the direction of the gaze. Gradual changes in the relation of the positions of the body and the axis of rotation produce gradual and not abrupt changes in the movement of the eyes. Rotation in the plane of one pair of vertical canals provokes a frontosagittal nystagmus. The customary examination of rotary and vertical nystagmus is not a physiological procedure. Examination in the planes of the canals is preferable.

Vilstrup [29] carried out a number of experiments on piked dogfish (Squalus acanthias vulgaris) and summarizes his work as follows:

> In the normal animal a cooperation is established between the macula utriculi and the anterior vertical semicircular canal under rapid acceleration on the see-saw board (chin-down movement). Under this, the rotation of the [eye] bulb amounts altogether to about 50°, of which the anterior semicircular canals are able at most to roll the bulbs 20° backwards round the axis of vision, while the maculae utriculi, on suitable stimulation, are able alone to rotate the bulbs 30°-40°.

Vilstrup [30] also reports studies on a horizontal deviation of the eyes resulting from stimulation of the ampulla of the anterior vertical canals in the piked dogfish. His experiments show that this reflex is not elicited from the crista of the lateral canal or macula utriculi and is not due to pressure variations in the endolymphatic system.

The function of the chorda tympani nerve has been looked upon as the carrying of preganglionic impulses of secretion to the submaxillary gland and of taste from the anterior two-thirds of the tongue. It has also been supposed that tastes were carried via the trigeminus nerve from the anterior part of the tongue. Costen and his co-workers [31] have been able to demonstrate pain impulses carried by the chorda tympani. They found an intact chorda tympani nerve in one of their patients on radical mastoidectomy, experimented with it, and continued the experiments in other suitable patients. The chorda tympani was stimulated by touch and electrical stimulation in the human subject studied after removal of the tympanic membrane in mastoidectomy, and they were able to elicit sensations of touch, pain, and taste. Histological studies were made in five human beings and one monkey on the size, type, and distribution of the fibers in cross section of the chorda tympani, and fibers were found of the size and type which carry pain, temperature, and touch, as well as taste in the specimens.

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28. Jongkees, L. B. W., and Hulk, J.: The Various Movements of the Human Eye on Rotation About Different Axes, Acta oto-laryng. **38**:274 (June) 1950.

29. Vilstrup, T.: Studies on a Section of the Collaboration Between the Anterior Vertical Semicircular Canals and the Macula Utriculi, Acta oto-laryng. **38**:63 (Feb.) 1950.

30. Vilstrup, T.: Studies on a Horizontal Component in the Reflex Mechanism of the Anterior Vertical Semicircular Canals in the Piked Dogfish, Acta oto-laryng. **38**:68 (Feb.) 1950.

31. Costen, J. B.; Clare, M. H., and Bishop, G. H.: The Transmission of Pain Impulses via the Chorda Tympani Nerve, Ann. Otol. Rhin. & Laryng. **60**:591 (Sept.) 1951.

Along with the subject of the function of the chorda tympani, it is of interest to read the report of Rosen [32] on the treatment of Ménière's disease by section of the chorda tympani, which relieves tinnitus in some cases. The author reports a series of such cases. He based his procedure on a theory described by Schneider.[33] The essence of this theory is that there are two sonic systems in man: first, the more recent, the cochlea, and second, the older, primitive sonic system derived from the lateral line organs of aquatic vertebrates. In these primitive animals the seventh and ninth cranial nerves carry the sonic and equilibratory impulses to the brain stem. The chorda tympani (seventh cranial) and tympanic plexus, Jacobson's nerve (ninth cranial), are derivatives of this primitive system, and both enter the geniculate ganglion. The chorda tympani nerve at the geniculate ganglion is a continuation of the nervus intermedius (nerve of Wrisberg) and the nervus intermedius communicates with the vestibular branch of the eighth cranial nerve (the newer sonic system) in the internal auditory canal. The old sonic system (seventh and ninth nerves) is connected with the newer sonic system (eighth nerve) via the geniculate ganglion and via branches of the tympanic plexus (Jacobson's nerve) to the oval and round windows. Thus, when these primitive sonic and equilibratory nerves, the seventh (chorda tympani) and the ninth (tympanic plexus; Jacobson's nerve), are affected, then impulses arising in the tongue, jaw joint, teeth, pharynx, tympanum, and sinuses can stream toward the geniculate ganglion, thence via the nervus intermedius to the eighth nerve or through the branches of Jacobson's nerve to the oval and round windows to give rise to capillary spasm and ultimately endolymphatic hydrops. The clinical picture of Ménière's disease would result.

32. Rosen, S.: Surgery in Ménière's Disease: A New Operation Which Preserves the Labyrinth, Ann. Otol. Rhin. & Laryng. **60**:657 (Sept.) 1951.

33. Schneider, D. E.: The Growth Concept of Nervous Integration, J. Nerv. & Ment. Dis. **105**:124 (Feb.) 1947.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology for 1951

BRONCHOESOPHAGOLOGY

F. JOHNSON PUTNEY, M.D.
AND
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PHILADELPHIA

STUDY of the second stage of deglutition by cineradiography has demonstrated for the first time the precise mechanism of this phase of swallowing. Another significant advance is the use of stereoscopic fluoroscopy for more accurate localization of radiopaque foreign bodies in the periphery of the lung, thereby aiding the bronchoesophagologist in their removal. Extension of its use to removal of foreign bodies in the stomach should provide additional help to endoscopists.

HISTOLOGY

By means of electron microscopy the structure of tracheal cilia was studied by Engström.[1] The cilia were found to be built up of an axial fibrillar core, ascending from a flask-shaped basal body. Around this bundle of fibrils was a thin fragile envelope, the ciliary sheath. Just above the basal body there was a thin cuticular plate, while from the lower end of the basal body a minute rootlet descended into the epithelial cell. The number of fibrils in each cilium was generally 10. The fibrils were thought by the author to be the contractile elements of the cilia.

PHYSIOLOGY

In studying the effect of vagotomy on the physiology of the human bronchi, Klassen and his associates[2] found that the cough reflex was abolished, indicating that the afferent fibers transmitting bronchial impulses resulting in initiation of the cough reflex are carried in the homolateral vagus nerve. In the majority of patients pain of bronchial origin was abolished on the homolateral side, while in others there was referral of pain to the contralateral anterior cervical region. These results suggested that certain of the afferent fibers transmitting pain from the tracheobronchial tree are carried by the contralateral vagus. After vagotomy no effect was noted upon the normal bronchial respiratory movements, in the amount or consistency of bronchial secretions, or in the ability of the tracheobronchial tree to clear itself of secretions.

1. Engström, H.: The Structure of Tracheal Cilia, Acta oto-laryng. **39**:364 (Oct.) 1951.

2. Klassen, K. P.; Morton, D. R., and Curtis, G. M.: Clinical Physiology of Human Bronchi: Effect of Vagus Section on Cough Reflex, Bronchial Caliber, and Clearance of Bronchial Secretions, Surgery **29**:483 (April) 1951.

A significant study of the mechanism of the second stage of deglutition by cineradiography was made by Saunders, Davis and Miller.[3] The second stage of deglutition has been designated as the involuntary contraction of the pharyngeal constrictors during laryngeal elevation which forces the bolus into the upper end of the esophagus. This stage of swallowing occurs with extraordinary rapidity and speeds of 1/30 to 1/60 of a second were required to stop motion and obtain evidence of the mechanism by cineradiography. Normal human deglutition was found to involve an initial rise of the larynx, a vigorous backward thrust of the base of the tongue, followed by a wave of pharyngeal constrictor muscle contraction. Although the action of the tongue was sufficient to propel fluids into the esophagus, solids were projected through the pharynx by the pharyngeal constrictors. The bolus was prevented from entering the larynx by the sphincteric action of the laryngeal aditus and vestibule, the elevation of the larynx, and the trapdoor movement of the epiglottis. The second stage of deglutition was divided into the following phases: (1) elevation of the larynx, (2) posterior thrust of the base of the tongue, (3) initial posterior-inferior movement of the epiglottis, (4) further elevation of the larynx, (5) final descent of the epiglottis, (6) sphincteric closure of the laryngeal aditus, (7) passage of a peristaltic wave down the pharyngeal constrictor muscles, (8) opening of the superior end of the esophagus, (9) return of the base of the tongue to the resting position, (10) return of the epiglottis to the upright position, and (11) descent of the larynx to the resting position.

ANESTHESIA

There remains a great diversity of opinion regarding the safest solution to use for local anesthesia in bronchoscopy. Weisel and Tella [4] studied 1,000 bronchoscopies in which 1.5 to 2 cc. of 2% tetracaine (pontocaine®) hydrochloride was used for anesthesia by application to the piriform fossae on cotton pledgets and by tracheal instillation. The patients received from 30 to 40 mg. of the drug, and all were given preliminary medication with barbiturates. Twelve minor and seven severe toxic reactions attributed to the anesthetic agent occurred. The reactions were considered severe when convulsions or severe respiratory signs appeared, and minor when the reaction did not progress so far. No untoward sequelae were noted in any of these patients, the severe reactions being controlled by 5 cc. of 2.5 thiopental (pentothal®) solution. Repeat bronchoscopy using the same anesthetic agent was performed on three patients, one of whom had previously had a severe reaction, with no resulting reaction or untoward effect. The authors do not condemn tetracaine any more than the other local anesthetic drugs but do believe the potential dangers of this drug must be recognized. By use of proper preoperative medication and small doses of the drug the incidence of reactions should be small.

An experimental investigation concerning the relationship of the rate of administration of certain topical anesthetics, notably cocaine and tetracaine, to their toxicity

3. Saunders, J. B. deC. M.; Davis, C., and Miller, E. R.: The Mechanism of Deglutition (Second Stage) as Revealed by Cine-Radiography, Ann. Otol. Rhin. & Laryng. **60**:897 (Dec.) 1951.

4. Weisel, W., and Tella, R. A.: Reaction to Tetracaine (Pontocaine®) Used as Topical Anesthetic in Bronchoscopy, J. A. M. A. **147**:218 (Sept. 15) 1951.

was conducted by Rubin and Kully.[5] Minimum lethal doses were found to be the same whether instillation was made in 2 minutes or 10. Detoxication of these drugs occurred so slowly that fractional instillation over a practical period of 10 minutes did not safely permit the use of a greater quantity than would be administered in a shorter period of time. The administration of topical anesthetics slowly with the thought that a greater quantity may be tolerated affords a false sense of security, but slow fractional instillation does allow time for a possible reaction to occur before the entire amount has been irretrievably given.

Rubin[6] conducted another experimental study using cocaine and tetracaine and reported as follows: With 10 per cent cocaine solution, reactions were obtained ranging from mild to severe, utilizing from 0.1 to 0.28 cc. per kilogram. Death occurred at 0.27 cc. per kilogram and over. With two per cent tetracaine solution, no reactions were recorded using up to 0.1 cc. per kilogram. Reactions were obtained ranging from moderate to severe when using 0.15 to 0.2 cc. per kilogram. Death occurred at 0.22 cc. per kilogram and over. As a particularly interesting corollary, when using tetracaine 0.5 per cent over the same period of time as with the 2 per cent solution, the reactions were identical. From these facts, Rubin concluded that the total dosage of the drug in milligrams was the chief factor in determining the severity of reactions and that dilutions did not effect decreased toxicity.

By animal experimentation Ireland and his associates[7] determined the mean fatal dose of cocaine to be 24 mg. per kilogram of body weight and of tetracaine 7.2 mg. per kilogram, giving a relative toxicity of tetracaine to cocaine of 3½ to 1. The usual practice of using tetracaine in one-fifth the concentration of cocaine might be expected to give tetracaine an advantage in safety, but this expectation was not confirmed by the authors' clinical survey. When 5% cocaine and 1% tetracaine were applied to the nasal septum, the time of onset of anesthesia was about twice as long with tetracaine as with cocaine. The duration of anesthesia was about equal with the two drugs, although the time of application of the cocaine was shorter. Severe complications and deaths were found more frequently with the use of tetracaine.

Local anesthesia for most peroral endoscopic procedures was advocated by Peters and Charbon.[8] Ether anesthesia was preferred for uncooperative children and for adults who require general anesthesia and are poor anesthetic risks. For the patient with limitation of vital cardiac or respiratory reserve the use of an inhalation agent which stimulates rather than depresses respiration is indicated. Intravenous injection of pentothal sodium probably should be employed only for the good-risk adult patients who have previously received atropine and topical

5. Rubin, H. J., and Kully, B. M.: Speed of Administration as Related to the Toxicity of Certain Topical Anesthetics, Ann. Otol. Rhin. & Laryng. **60**:627 (Sept.) 1951.

6. Rubin, H. J.: Toxicity of Certain Topical Anesthetics Used in Otolaryngology, A. M. A. Arch. Otolaryng. **53**:411 (April) 1951.

7. Ireland, P. E.; Ferguson, J. K., and Stark, E. J.: Clinical and Experimental Comparison of Cocaine and Pontocaine as Topical Anesthetics in Otolaryngological Practice, Laryngoscope **61**:767 (Aug.) 1951.

8. Peters, M. P., and Charbon, H. G. A.: Anesthetic Hazards in Oral Endoscopy, Acta oto-laryng. **39**:418 (Oct.) 1951.

anesthesia. Curare may be added occasionally to facilitate relaxation, if used with caution. Hypoxia is not permitted in any of these procedures.

In discussing anesthesia for peroral endoscopy, Scharfe [9] points out the value of premedication and advocates the use of barbiturates routinely. Morphine was administered to the patients studied, except the very young, the very old, and those patients with considerable bronchial secretion or laryngeal obstruction. The anesthetic agent used was pontocaine hydrochloride (1%) in the amount of 4 cc., to which was added 1 cc. of epinephrine. For bronchoscopy it was administered by pharyngeal spray and intratracheal instillation. As little anesthetic agent was used as possible, the quantity was carefully measured, and the necessary drugs and equipment were available to combat reactions if they occurred. In the five year period in which pontocaine was used, there was one death, one severe reaction, and two mild reactions. The fatality followed the taking of a bronchogram on an asthmatic patient to whom 2% pontocaine was given. Esophagoscopy was performed with the patients under general anesthesia, and general anesthesia was also used in certain cases in which bronchoscopy was done, as removal of foreign bodies in children. Laryngoscopy in adults was done with local anesthesia for (1) biopsy of large tumors in which the vocal cord was not liable to be damaged, (2) repeated examinations and treatment, and (3) laryngeal obstruction. Laryngoscopy with thiopental and curare anesthesia was preferred for removal of benign tumors, for the author believes less damage to the vocal cord results.

McLaurin [10] reports the use of curare in 55 esophagoscopies on 53 patients, with one untoward reaction. Excellent relaxation was secured in cases of overly nervous and apprehensive patients for whom it was believed topical analgesia would not be sufficient. The technic employed was as follows: After the pharynx and larynx are anesthetized locally, curare is introduced into the cubital vein. For an adult weighing 150 lb. (68 kg.) an injection of 1 cc. (20 units) is given over a period of 30 seconds. After two minutes, the patient is asked to raise his head; if he can, an additional injection of 1 cc. of curare is given. Oxygen is kept ready at all times. Sensitization to curare occurs, and if the drug is used a second time the patient first receives a skin test. Curare should not be used to extend the indications for esophagoscopy.

Sadove and associates [11] report the use of curare in attempting to obtain a satisfactory relaxation for various difficult endoscopic procedures. It is pointed out that curare in its liberation of histamine will effect a fall in blood pressure by causing peripheral vascular dilatation; the same substance will also cause rather marked bronchospasm and salivation. Because of these untoward effects of curare, the use of one of the antihistaminic substances as preoperative medication is advocated. It is also suggested that morphine as a preoperative medication be avoided because of its depressive effect on respiration.

9. Scharfe, E. E.: Anesthesia for Peroral Endoscopy, Canad. M. A. J. **65**:134 (Aug.) 1951.

10. McLaurin, J. W.: Curare as Adjunct to Relaxation in Esophagoscopy, Ann. Otol. Rhin. & Laryng. **60**:51 (March) 1951.

11. Sadove, M. S.; Gittelson, L. A.; Wyant, G. M.; Kretchner, H. E., and Holinger, P. H.: The Use of Curare Drugs in Endoscopy, Laryngoscope **61**:39 (Jan.) 1951.

ALLERGY

Davison [12] points out that hyperimmunity or overreaction to infection or other irritants when occurring within the confines of the bronchi produces obstruction, causing dyspnea and often atelectasis, which can lead to bronchiectasis. He focuses attention on infectious bronchitis, which is apt to be minimized or overlooked in asthmatic patients. Bronchoscopy was used as a means of diagnosis and treatment. In diagnosis bronchoscopic examination not only ruled out other causes of wheezing but also gave a definite idea of the degree of bronchial thickening and furnished uncontaminated specimens of exudate for smear and culture, including antibiotic sensitivity studies. Therapeutic benefit was obtained in 64% of the cases reviewed by bronchoscopic aspiration of viscid secretion which the patient had been unable to cough out, and was particularly helpful for the patients who had Loeffler's syndrome.

HEMOPTYSIS

In Hennessy's [13] experience, hemoptysis in the majority of patients without other symptoms is due to unsuspected bronchiectasis. The most conclusive means of diagnosis is by bronchoscopy and bronchography.

BRONCHOSCOPY IN NEWBORN

Rosedale [14] considers bronchoscopy in the newborn to be practical, safe, and at times lifesaving. It serves to remove the fluid and any material aspirated during an otherwise normal birth. Congenital anomalies, such as tracheoesophageal fistula and bronchial agenesia, may also be detected. The cases in which bronchoscopy is helpful are not those with failure of respiration, due to central arrest from birth anesthesia or other medications, and intracranial trauma, but rather, those with obstruction of the respiratory tract. A direct lighted approach, with working accessibility, is superior to blind and indirect methods of resuscitation.

TRAUMA FROM ENDOTRACHEAL INTUBATION

Flagg [15] reviews the reasons for accidents with endotracheal anesthesia and cites his experience over many years. The greater incidence of trauma in intubation of the unconscious patient was attributed to the use of larger tubes, subglottic packs, and blind intubation. The size of endotracheal tubes employed for nontraumatic intubation in relaxed patients should range from 4 up to and including 10 mm. outside diameter. Subglottic packs and blind intubation are not advisable. The present trend of anesthesia away from the use of gases and toward the use of drugs, with the consequent failure of relaxation and reflex control, increases the difficulty of intubation.

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12. Davison, F. W.: The Allergic Factor in Chronic Bronchopulmonary Infections, Ann. Otol. Rhin. & Laryng. **60**:948 (Dec.) 1951.

13. Hennessy, J. J.: Obscure Pulmonary Bleeding, Ann. Otol. Rhin. & Laryng. **60**:819 (Sept.) 1951.

14. Rosedale, R. S.: Bronchoscopy in Newborn: Otolaryngologist's Contribution to Obstetrics, A. M. A. Arch. Otolaryng. **53**:393 (April) 1951.

15. Flagg, P. J.: Endotracheal Inhalation Anesthesia: Special Reference to Post-Operative Reactions and Suggestions for Their Elimination, Laryngoscope **61**:818 (Aug.) 1951.

In a study of 80 consecutive cases with endotracheal anesthesia, Baron and Kohlmoos [16] found 15 cases with laryngeal sequelae. There were eight cases of laryngeal obstruction, caused by edema in four cases and from occluding membranous laryngitis or tracheitis in four cases, and seven cases of laryngeal granuloma. The common site of the granulomas was near the vocal process of the arytenoid, and in the majority the lesions were bilateral. All the patients recovered, but one required a year for complete healing. The authors are of the opinion that, since important laryngeal sequelae occur from endotracheal anesthesia in adults and children and are not uncommon in children, this method of anesthesia should not supplant other adequate measures of anesthesia in children.

Four cases of granuloma of the larynx following intratracheal anesthesia were reported by Peimer and Feuerstein.[17] The lesions followed intubations of over two hours, and hoarseness developed immediately after operation in one case, while in the others a delay of six weeks to six months before the onset of symptoms occurred.

TRAUMATIC RUPTURE OF TRACHEA AND BRONCHI

Henry [18] reported a case of traumatic rupture of the lower trachea with stenosis following a crushing chest injury. The rupture occurred about 1½ in. (3.8 cm.) above the carina, with obstruction from granulation tissue. After the lowest possible tracheotomy, stenosis developed in the injured tracheal wall, with extrusion of cartilage through the wound. After several months of dilatation of the stenosed area by means of metal dilators through the tracheotomy opening, the stenosis improved and the area was lined with mucous membrane. Although the stenosis healed with an adequate airway, it did not become firm enough to allow decannulization, and the trachea tended to collapse on inspiration.

Paulson [19] reported two cases of traumatic bronchial rupture, in one of which a stricture developed, followed by bronchiectasis. In the other case bronchoscopy was performed soon after the accident and a complete bronchial occlusion was observed, enabling the author to perform a bronchoplasty with restoration of the bronchial lumen and prevention of future suppurative complications.

TRACHEOBRONCHIAL ASPIRATION

Culver and his co-workers [20] studied 300 surgical patients to determine the frequency of aspiration of gastric contents into the lungs. A dye was introduced into the stomach preoperatively, and as soon as the operation was over bronchoscopy was performed. Regurgitation of the dye in the pharynx occurred in 79 cases, while in 49 patients the dyed gastric content was aspirated into the lung.

16. Baron, S. H., and Kohlmoos, H. W.: Laryngeal Sequelae of Endotracheal Anesthesia, Ann. Otol. Rhin. & Laryng. **60**:767 (Sept.) 1951.

17. Peimer, R., and Feuerstein, S. S.: Laryngeal Granuloma Following Intratracheal Anesthesia, Laryngoscope **61**:165 (Feb.) 1951.

18. Henry, G. A.: Traumatic Rupture of the Lower Trachea with Stenosis, Canad. M. A. J. **64**:134 (Feb.) 1951.

19. Paulson, D. L.: Traumatic Bronchial Rupture with Plastic Repair, J. Thoracic Surg. **22**:636 (Dec.) 1951.

20. Culver, G. A.; Makel, H. P., and Beecher, H. K.: Frequency of Aspiration of Gastric Contents by Lungs During Anesthesia and Surgery, Ann. Surg. **133**:289 (March) 1951.

An episode of acute bronchitis superimposed on chronic pulmonary disease, as chronic asthmatic bronchitis and emphysema, pulmonary fibrosis, or bronchiectasis, may so obstruct the bronchial lumen that death occurs from suffocation. In discussing the treatment of this condition, Cardon and his associates [21] believe the two most important measures are repeated aspiration of the tracheobronchial tree and oxygen therapy. They urge caution in the instillation of liquid medication through the bronchoscope, for this may precipitate asphyxia by blocking the narrowed bronchi.

The use of bronchoscopy as a part of the treatment in certain cases of spontaneous and traumatic pneumothorax is advocated by Rubin and Rubin.[22] Bronchial obstruction with or without demonstrable atelectasis may complicate a spontaneous or traumatic pneumothorax, preventing reaeration of the lung. Bronchoscopic aspiration was employed to rid the bronchi of secretion and allow air to enter the affected lobe or lobes.

ACUTE LARYNGOTRACHEOBRONCHITIS

Everett [23] analyzed a series of 1,175 cases of acute laryngotracheobronchitis during the decade 1940-1949 inclusive and reports a lowering of the mortality rate to 2%, whereas a similar group in the previous decade, 1930-1939, had a mortality rate of 9.8%. The greatest single factor in the reduction of mortality was the almost universal use of the antibiotic drugs. The authors found a decrease in mechanical and surgical interventions, including intubation, tracheotomy, and direct laryngoscopy. In addition to the antibiotics, cool vapor with oxygen and early tracheotomy when indicated were advocated in treatment.

Mathieu and his co-workers [24] describe a simple and inexpensive method of providing humidity, controlling temperature, and maintaining a high concentration of oxygen in the treatment of acute laryngotracheitis. Cold vapor was supplied by the use of a wetting agent (sodium lauryl sulfate 0.1%). The drug was nontoxic and nonallergic in the 10 patients treated.

Reviewing the autopsy findings of 178 infants who died with the diagnosis of pneumonia, bronchitis, or laryngotracheobronchitis, Jersild and Riskaer [25] found infectious atelectasis in 43%. The relatively high death rate from pneumonia in infants despite treatment with antibiotics and sulfonamide preparations is probably due to unrecognized and untreated infectious atelectasis. The most important therapeutic measures in treating this condition are early and repeated bronchoscopic aspirations and immediate employment of antibiotics.

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21. Cardon, L.; Lemberg, L., and Greenebaum, R. S.: Acute Suppurative Bronchitis and Bronchiolitis in Chronic Pulmonary Disease: Diagnosis and Management, Ann. Int. Med. **34**:559 (March) 1951.

22. Rubin, M., and Rubin, E. H.: Bronchoscopy in the Treatment of Spontaneous and Traumatic Pneumothorax, J. Thoracic Surg. **21**:377 (April) 1951.

23. Everett, A. R.: Acute Laryngotracheobronchitis: An Analysis of 1175 Cases with 98 Tracheotomies, Laryngoscope **61**:113 (Feb.) 1951.

24. Mathieu, P. L., Jr.; West, E.; Lehman, S., and Mathieu, B.: A Cold Vapor Apparatus for the Treatment of Acute Laryngotracheitis, Ann. Otol. Rhin. & Laryng. **60**:668 (Sept.) 1951.

25. Jersild, T., and Riskaer, N.: Acute Infectious Atelectasis Simulating Bronchopneumonia in Infants, Laryngoscope **61**:923 (Sept.) 1951.

Von Leden [26] stresses the importance of humidification in the management of patients with acute laryngotracheobronchitis. For the treatment of children suffering from laryngitis he has designed a humidification room in which there is a relative humidity of approximately 90% with the room temperature about 68 to 70 F. The advantages of tracheotomy over intubation, with emphasis on early tracheotomy, are also discussed.

BRONCHOGRAPHY

Eeman [27] stresses the need for patient efforts on the part of endoscopists to utilize bronchography as a diagnostic method for the infant and very young child. The dangers of bronchography are listed as follows: (1) risk of anesthesia, (2) risk of the technical procedure of introduction of the opaque medium, (3) risk of respiratory difficulty due to the filling of the tracheobronchial tree, (4) risk of intoxication due to iodine. The existence of these risks is recognized, but the author does not believe that they are any greater for the infant than for the adult. Perfect technique, fast work, and patience, are necessary to execute correct filling and perform serviceable bronchographies in infants and very young children.

Norris and Stauffer [28] recorded their observations on the properties and uses of 2 aqueous contrast media ("umbradil viscous B" and "ioduron B") for bronchography. The aqueous preparations were found to be rapidly eliminated, chemically stabile, and free from systemic toxic effect, and to possess a viscosity which may be varied to obtain different roentgenologic patterns. Because of their greater, though transient, irritant effect, the aqueous media required well-distributed and more complete topical anesthesia. Bronchograms made with these preparations were not, in general, more informative than those obtained with iodized oil. General adoption of the aqueous solutions for routine bronchography will depend upon further study to determine whether the tissue response is of significantly smaller degree than that occurring following instillation of the oily solutions.

Occurrence of severe iodine reaction following bronchography is uncommon, but a fatal case of iodism following this procedure was described by Sumner, Lichter, and Nassau.[29] After the instillation of 14 cc. of iodized oil through the cricothyroid membrane, acute iodism developed within four hours and progressed to death two weeks later. At autopsy the histologic findings were those of polyarteritis nodosa.

Rabinowitz and Harper [30] performed bronchography, using iodized oil, on 100 tuberculous patients and obtained 83 abnormal bronchograms, the majority of the lesions being found in the posterior segment of the upper lobe and the apical sub-

26. Von Leden, H.: Acute Laryngo-Tracheo-Bronchitis and Its Management, Illinois Med. Jour. **99**:10 (Jan.) 1951.

27. Eeman, F. G.: Bronchography in the Infant and Very Young Child, Ann. Otol. Rhin. & Laryng. **60**:793 (Sept.) 1951.

28. Norris, C. M., and Stauffer, H. M.: Aqueous Contrast Media in Bronchography, Ann. Otol. Rhin. & Laryng. **60**:802 (Sept.) 1951.

29. Sumner, J.; Lichter, A. I., and Nassau, E.: Fatal Acute Iodism After Bronchography, Thorax **6**:193 (June) 1951.

30. Rabinowitz, P., and Harper, I. S. H.: Bronchography in Pulmonary Tuberculosis, Dis. Chest **19**:66 (Jan.) 1951.

division of the lower lobe. The authors recommended preoperative bronchographic study, and in their cases spread of the disease, iodism, or retained residual iodized oil did not occur.

FOREIGN BODIES

A study of 374 cases of foreign bodies of the air and food passages is presented by Gill and his associates.[31] The food passages were more frequently involved than the air passages in the approximate ratio of 3 : 1. Consideration was given to history, physical examination, roentgen and fluoroscopic study in the diagnosis. The treatment was by endoscopic removal. Tracheotomy was performed in 24 cases. Tracheobronchitis and pneumonia were occasional complications, probably due more to the foreign body than to the instrumentation. There were 5 deaths, with a mortality rate of 1.4%.

Barrett[32] reviewed a series of 108 cases of foreign bodies in the air or food passages. For removal, local anesthesia was used for the adults but general anesthesia was employed for approximately half of the children. The foreign bodies most frequently encountered were bones, coins, and meat. All tracheobronchial foreign bodies were found in children under 5 years of age, and there was a delay in diagnosis in 46%. Nonfatal perforation of the esophagus occurred in 2 patients. There was one death in the series. Two tracheotomies were necessary, and in one case external operation was employed for removal of a marble in the cricopharyngeal sphincter.

Hill[33] reported two cases of porcupine quills as foreign bodies in the air and food passages. In one case the foreign body was lodged in the tip of the epiglottis, and in the other it was embedded in the posterior wall of the hypopharynx and extended across the glottis. Because of the nature of the foreign body, with backward-pointing barbs, considerable traction was necessary for extraction.

Endoscopic removal of three foreign bodies (bones) from one patient was accomplished by McGrath.[34] The foreign bodies were lodged one in each piriform fossa and the third below the level of the cricopharyngeus.

A significant advance in the management of radiopaque bronchial foreign bodies has been the use of stereoscopic fluoroscopy. One of the most annoying problems in endoscopy is that of straight pins lodged in the terminal bronchi, and for such cases fluoroscopic direction is essential for successful removal. Miller[35] has supplanted the use of the biplane fluoroscope with a newly invented stereofluoroscope, which has simplified the removal of most of the straight pins from the peripheral bronchi. With use of this instrument foreign bodies, as well as anatomic parts, do not appear as shadows but rather as actual objects, and the radiologist is able at all times to give correct information to the endoscopist regarding the exact relation of

31. Gill, E. G.; Bell, H. L., and Mertz, R. D.: Management of Foreign Bodies in the Air and Food Passages, Eye, Ear, Nose and Throat Monthly **30**:206 (April) 1951.

32. Barrett, J. H.: Foreign Bodies in the Air and Food Passages, A. M. A. Arch. Otolaryng. **54**:651 (Dec.) 1951.

33. Hill, F. T.: Porcupine Quills as Laryngeal Foreign Bodies, Ann. Otol. Rhin. & Laryng. **60**:751 (Sept.) 1951.

34. McGrath, J. B.: An Unusual Case of Multiple Foreign Bodies, Ann. Otol. Rhin. & Laryng. **60**:704 (Sept.) 1951.

35. Miller, A. H.: Management of Aspirated Straight Pins in the Bronchi Utilizing the Stereoscopic Fluoroscope, A. M. A. Arch. Otolaryng. **53**:68 (Jan.) 1951.

the bronchoscope and forceps to the foreign body. The three dimensional view makes it possible to proceed much faster than when a biplane fluoroscope is used, since there is a single viewing position and it is not necessary to compare the views in two separate screens. The stereofluoroscope may be used for either vertical or horizontal fluoroscopy, and any necessary adjustments incident to movement of the screen or tubes is made automatically without movement by the operator. The following interesting observations were made by the author during the early use of this fluoroscope: 1. The fluoroscopist must have stereoscopic vision himself. 2. Until the forceps entered the bronchus that contained the foreign body, the object seemed to move about widely with respirations. 3. As soon as the forceps entered the correct bronchus, the foreign body became stationary.

A case of respiratory foreign body (kernel of corn) in a 10-month-old infant with fatal outcome is reported by Shiffer.[36] There was a typical history of bronchial foreign body with attacks of cough, strangling, and cyanosis for 14 days before admission to the hospital, and two attacks, the last being fatal, occurred while the patient was in the hospital awaiting roentgen confirmation of the diagnosis and bronchoscopy. After suffocation, bronchoscopy was performed and a swollen kernel of corn, lodged apex upward, was removed from the glottis.

Four patients with bronchiectasis treated by resection were found by Moore[37] to have an unsuspected intrabronchial foreign body in the portion of lung removed. There was no history to suggest the inhalation of a foreign body even on questioning after operation. In all four cases hemoptysis was a marked symptom.

PULMONARY HODGKIN'S DISEASE

Atkins and his co-workers[38] reviewed the intrathoracic lesions of malignant lymphoma, particularly Hodgkin's disease, and noted that accurate histologic diagnosis can be made from peripheral manifestations in most cases. Endobronchial involvement represented 14% of the intrathoracic lesions of Hodgkin's disease found at autopsy, but such lesions were rare in other types of lymphoma. Occasionally the only apparent lesions of Hodgkin's disease are confined to the bronchopulmonary tree, presenting a clinical picture that may be indistinguishable from bronchial carcinoma and other common pulmonary diseases. Bronchial carcinoma, on the other hand, may produce a clinical picture that simulates a malignant lymphoma, and bronchial and peripheral lymph node biopsies may be inconclusive in either disease.

SUPERIOR VENA CAVA OBSTRUCTION SYNDROME

Three cases of superior vena cava obstruction, caused by adjacent encroaching malignant lesions, are reported by Lell.[39] The patients had the characteristic swell-

36. Shiffer, P. H.: Foreign Body in the Respiratory Tract, Pennsylvania M. J. **54**:657 (July) 1951.

37. Moore, B. P.: Bronchiectasis with Unsuspected Foreign Body, Brit. M. J. **2**:1259 (Nov. 24) 1951.

38. Atkins, J. P.; Sullivan, R. D., and Jones, R., Jr.: Endobronchial Lymphoma and Its Simulation by Bronchogenic Carcinoma, Ann. Otol. Rhin. & Laryng. **60**:849 (Sept.) 1951.

39. Lell, W. O.: Superior Vena Caval Obstructive Syndrome, Ann. Otol. Rhin. & Laryng. **60**:754 (Sept.) 1951.

ing of the neck and engorgement of the veins of the chest. On endoscopic examinations there was no encroachment on the trachea or right main bronchus, and cytologic examinations of the bronchoscopically removed secretions failed to reveal tumor cells in two cases and raised a suspicion of their presence in the other case. The diagnosis was established by exploratory thoracotomy.

TRACHEOBRONCHIAL TUBERCULOSIS

Bronchoscopy aids in the recognition of tuberculous bronchial conditions in adults but is not often used to detect similar involvement in primary tuberculosis of children. Citing several illustrative cases. Laff and his associates [40] point out the importance of bronchoscopic investigation in primary tuberculosis of children. Not only should bronchoscopy be performed on children with wheezing, atelectasis, or obstructive emphysema but also for patients with childhood tuberculosis whose progress is not satisfactory. Bronchial obstruction may be brought about by pressure from enlarged lymph nodes, by endobronchial disease, or by plugging of the bronchial lumen with caseous material. Of 15 cases of primary tuberculosis with either wheezing or persistent atypical roentgen findings, the authors aspirated caseous material in 7 and were able to visualize the actual point of rupture on repeated bronchoscopic examinations. Frequent aspiration of caseous material was advocated to improve the airway and prevent passage into smaller bronchi with subsequent spread of the disease.

One hundred cases of tuberculous tracheobronchitis were found in the bronchoscopic examinations of 527 tuberculous patients by Hiltz and his co-workers.[41] The bronchi only were involved in 87 cases and the trachea alone in 3, whereas both the trachea and the bronchi were involved in 10. Eight cases were cases of relapse in persons whose lesions completely disappeared bronchoscopically under treatment. Streptomycin combined with paraaminosalicylic acid was the treatment of choice, but in cases with exuberant granulations topical application of silver nitrate was helpful. The authors believe that dilatation of stenosed bronchi is rarely indicated and may be harmful.

Himalstein [42] points out that bronchoscopic study is the only objective means of judging the effect of nonsurgical collapse therapy on the bronchi of a tuberculous patient. The rise of the diaphragm produces characteristic deformity of the main bronchi. Sharp dorsal angulation of the left main bronchus above the lobe orifices favors the development of endobronchial disease. Optimum diaphragm rise, rather than maximal rise, based on bronchoscopic observation in the individual case is the more rational approach.

Hodell [43] discusses the importance of bronchoscopy as a means of identifying and removing obstructive bronchial plugs in the pneumothorax patient, as a means

40. Laff, H. I.; Hurst, A., and Robinson, A.: Importance of Bronchial Involvement in Primary Tuberculosis of Childhood, J. A. M. A. **146**:778 (June 30) 1951.

41. Hiltz, J. E.; MacRae, D. M., and Quinlan, J. J.: Tuberculous Tracheobronchitis, Dis. Chest **20**:313 (Sept.) 1951.

42. Himalstein, M. R.: Bronchoscopy in Tuberculosis: Deformity of Major Bronchi Associated with High Diaphragm Rise in Certain Forms of Non-Surgical Collapse Therapy, Dis. Chest **19**:346 (March) 1951.

43. Hodell, G. R.: Role of Bronchoscopy in Artificial Pneumothorax, Dis. Chest **19**:58 (Jan.) 1951.

of finding the source of positive sputum, and as a means of diagnosing and treating active endobronchial tuberculosis. Closure of large tuberculous cavities and healing of the coexisting endobronchial disease, substantiated by a four-year follow-up, was effected by bronchoscopic therapy in three cases in which the cavities remained despite satisfactory pneumothorax. Three additional cases are cited, in which recovery was only apparent and recurrence of cavitation took place 6, 10, and 12 months respectively after bronchoscopic treatment.

In a study of 305 cases of pulmonary tuberculosis, Jones and Alley [44] found a relatively high incidence of endobronchial disease on bronchoscopic examination. The larger bronchi were frequently stenosed, while the smaller bronchi were occasionally dilated but were oftener destroyed by tuberculous disease. Lesions of the smaller bronchi were more numerous and severer than those of the larger bronchi.

In reporting their bronchoscopic findings in 150 patients with pulmonary tuberculosis, Levi-Valensi and his co-workers [45] noted that fistulas due to perforation of lymph nodes were frequent findings. In some cases of atelectasis there was no ulceration of the bronchial mucosa. Antihistaminic drugs were found to diminish or abolish postbronchoscopic reactions and were also used locally on the bronchial mucosa to abolish cough during the examination.

Marshall and his co-workers [46] reported the results obtained with streptomycin therapy over a period of four months for 35 patients with tuberculous lesions of the trachea and bronchi. Bronchoscopy was done before, during, and after treatment. In 24 patients the bronchial lesion was found to be greatly improved or healed four to six months after the start of treatment. In 15 patients there was much improvement in the appearance of the bronchial lesion two months after the beginning of treatment. A satisfactory later response of the bronchial lesion was unusual if some improvement was not found within two months. Bronchial stenosis was present before treatment in 15 patients, and in 7 more it developed during treatment. In two patients, in spite of streptomycin therapy, masses of granulation tissue required repeated bronchoscopic removal.

Judd [47] reviewed a series of 558 consecutive tuberculous patients and concluded that although streptomycin is an extremely valuable adjunct in the treatment of tuberculous endobronchitis, it is not 100% curative. It is curative in a greater number of cases than any other method now available except the control of the parenchymal lesion. Healing and epithelization of tuberculous tracheal and bronchial lesions occurred rapidly under streptomycin therapy; hence careful attention was necessary lest sudden stenosis develop. In the presence of stenotic lesions attempts to maintain an adequate airway by bouginage proved of no avail.

O'Keefe [48] reports the occurrence of a pedunculated tuberculoma in the left stem bronchus of a 7-year-old Negro child. In this instance, the sputum was nega-

44. Jones, R. S., and Alley, F. H.: Role of Bronchi in Pulmonary Tuberculosis: Review Based on Study of 305 Cases, Am. Rev. Tuberc. **63**:381 (April) 1951.

45. Levi-Valensi, A.; Zaffran, A., and Molina, C.: Bronchoscopic Findings in 150 Adults Suffering from Pulmonary Tuberculosis, Semaine hôp. Paris **27**:171 (Jan. 14) 1951.

46. Marshall, G.; Blacklock, J. W. S.; Cameron, C., and others: Streptomycin Treatment of Tuberculous Lesions of Trachea and Bronchi, Lancet **1**:253 (Feb. 3) 1951.

47. Judd, A. R.: The Application of Streptomycin in Tuberculous Bronchitis, Ann. Otol. Rhin. & Laryng. **60**:828 (Sept.) 1951.

48. O'Keefe, J. J.: Primary Tuberculoma of the Bronchus, Ann. Otol. Rhin. & Laryng. **60**:824 (Sept.) 1951.

tive for tubercle bacilli and serial roentgen studies of the chest were negative for evidence of pulmonary tuberculosis. Histologic sections of this tumorous mass revealed the presence of caseation and of acid-fast bacilli.

An instance of the presence of acid-fast Nocardia in the tracheobronchial secretions was reported by Mogabgab and Floyd.[49] The finding of such microorganisms in the bronchial secretions or sputum may be responsible for erroneously labeling such patients as tuberculous.

ATELECTASIS

Eight cases of atelectasis of the right middle lobe secondary to perforation of tuberculous lymph nodes into the bronchi were studied by Cohen.[50] All the patients were female, and with one exception they were all over 60 years of age. The bronchus of the middle lobe seems particularly vulnerable to this process because of its small caliber and close proximity to chains of lymph nodes. In two cases, tubercle bacilli were found in the sputum, while in the six other cases there was no evidence of active infection. Bronchoscopic examination revealed a marked narrowing of the middle lobe orifice by a bulge or annular constriction in five cases. In four of these and in two other cases there was involvement of the right main bronchus or one of its larger branches. In the remaining case a broncholith was removed from the middle lobe bronchus. Anthracotic pigment was seen in the bronchial mucosa in five cases. Biopsy in one case with no acid-fast bacilli in the sputum suggested tuberculosis. Isolated middle lobe atelectasis on the roentgenogram should raise a suspicion of perforation by tuberculous lymph nodes.

BRONCHIAL ADENOMA

The origin of adenoma of the bronchus is still unsettled. In studying 17 cases, Huizinga and Iwema[51] concluded that this tumor is a special localization of the parabuccal mixed tumor, which originates from the bronchial glands. In three cases histologic section revealed a part of the tumor to be an adenoma and other portions to be a cylindroma. Various factors, e. g., the patient's age, localization and extent of the tumor, and histologic picture, affect therapy. Both bronchoscopic and surgical treatment yield excellent results in selected cases.

In reviewing his experience with bronchial adenoma, Chevalier Jackson[52] believes that this tumor should be classified as borderline, in some cases malignant and in other cases benign. This would leave to the physician and surgeon in charge of the individual patient the decision to do what they think best for the individual case. Jackson cites a case of a histologically malignant obstructive bronchial tumor which proved to be clinically benign, as shown by freedom from recurrence for 35 years after bronchoscopic removal of the tumor. Although histologic classification is fundamental, a scientific means of differential diagnosis between benign and malignant behavior of this tumor is needed.

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49. Mogabgab, W. J., and Floyd, J. L.: Acid-Fast Nocardia Causing Erroneous Diagnosis of Tracheobronchial Tuberculosis, New Orleans M. & S. J. **104**:28 (July) 1951.

50. Cohen, A. G.: Atelectasis of Right Middle Lobe Resulting from Perforation of Tuberculous Lymph Nodes into Bronchi in Adults, Ann. Int. Med. **35**:820 (Oct.) 1951.

51. Huizinga, E., and Iwema, J.: Adenoma of the Bronchus, Ann. Otol. Rhin. & Laryng. **60**:290 (June) 1951.

52. Jackson, C.: Bronchial Adenoma, Dis. Chest **20**:347 (Oct.) 1951.

Bronchoscopy is important in the diagnosis, visualization, and biopsy of bronchial adenoma. Jackson and Norris [53] report the cases of 36 patients with a carcinoid type of bronchial adenoma, 24 of whom were treated by bronchoscopic removal, and all but 2, whose status is not known, are well. Bronchoscopic removal was also performed on four patients with the cylindroma type of adenoma, two of whom died despite bronchoscopic treatment and two of whom were asymptomatic although they required bronchoscopic treatment. Subdivision into various types like carcinoid and cylindroma were useful, but the main source of confusion in bronchial adenoma still remains the histopathologic designation. The method of treatment should be based on a study of the individual case, and surgical resection should not be performed automatically, as is done for carcinoma.

In presenting five cases of bronchial adenoma, Doty [54] found that in three the tumors could not have been properly treated by bronchoscopy. Bronchial adenoma extends or metastasizes peribronchially and to the mediastinum, and so if the tumor invades at all then only rarely is it possible to adequately remove it bronchoscopically.

Smoller [55] reports the occurrence of an adenoma of the bronchus in a 9-year-old child. This is one of the youngest patients recorded with bronchial adenoma.

LIPOMA OF BRONCHUS

Lipoma of the bronchus is an unusual tumor and produces varying degrees of bronchial obstruction. Two cases are reported by Som and Feuerstein.[56] Both patients had a chronic cough for years, but the onset of hemoptysis led to bronchoscopy and discovery of the tumor. In both cases the tumor was benign, pedunculated, and attached by a narrow pedicle. Endoscopic removal was accomplished by avulsion with grasping forceps. After removal of the obstructing tumor the infection cleared and the affected lobe returned to normal. No evidence of recurrence was detected two and one-half years and one year respectively following removal.

Touroff and Seley [57] report 2 cases of lipoma of the bronchus and lung; in one the tumor involved the parenchyma of the lung only and in the other the neoplasm was of the "dumbbell" type in the bronchus and peribronchial tissues. In the case of the parenchymal lipoma there were no symptoms referable to the lung, while in the case of the bronchopulmonary lipoma chronic cough and recurrent hemoptysis with atelectasis of the involved lobe were present.

A case of endobronchial lipoma, which was observed bronchoscopically to obstruct the left upper lobe bronchus, was reported by Carlisle, Leary, and Mc-

53. Jackson, C. L., and Norris, C. M.: Role of Bronchoscopy in Diagnosis and Treatment of Bronchial Adenoma, Dis. Chest **20**:353 (Oct.) 1951.

54. Doty, R. D.: Bronchial Adenoma: Nomenclature and Present Methods of Treatment, J. Thoracic Surg. **21**:349 (April) 1951.

55. Smoller, S.: Adenoma of the Bronchus in a 9 Year Old Child, A. M. A. Am. J. Dis. Child. **82**:587 (Nov.) 1951.

56. Som, M. L., and Feuerstein, S. S.: Endoscopic Removal of Lipoma of Bronchus, A. M. A. Arch. Otolaryng. **54**:341 (Oct.) 1951.

57. Touroff, A. S. W., and Seley, G. P.: Lipoma of the Bronchus and the Lung, Ann. Surg. **134**:244 (Aug.) 1951.

Donald.[58] The typical symptoms associated with bronchial obstruction were present. Because of its location in the upper lobe, it was removed by thoracotomy.

SCHWANNOMA OF BRONCHUS

Straus and Guckien [59] report the occurrence of a schwannoma arising in the orifice of the left main bronchus. The tumor was removed endoscopically and without postoperative incident.

BRONCHIAL CYTOLOGY

Farber and his associates [60] state that little theoretical limitation exists for the diagnosis of very early malignant lung lesions by cytologic examinations of sputum and bronchial secretions. The early diagnosis of pulmonary cancer can be achieved by cytologic study when this procedure is applied to all patients suspected of having carcinoma, to patients with equivocal lung lesions, and as a routine screening procedure in selected cases with cough and sputum. A positive cytologic diagnosis was made in 55% of 241 cases of bronchogenic carcinoma, and in 47% of these cases this was the first diagnostic procedure to establish a morphologic diagnosis. In 46% the positive cytological diagnoses coincided with other ordinary methods in establishing the diagnosis, and in only 7% the positive cytological diagnosis was reported after the diagnosis had been established by another pathological method. Only two false positive diagnoses were made. In cases of peripheral and upper lobe lesions and in cases of coexistent pulmonary tuberculosis and carcinoma, cytologic studies have clarified the diagnosis.

Clerf, Herbut, and Nealon [61] studied a series of 488 cases of diagnosed and 322 cases of surgically proved bronchogenic carcinoma; they discuss the findings by biopsy and cytologic examination of bronchoscopically removed secretions. While a positive biopsy report gave greater diagnostic security, a positive cytologic finding was found equally dependable from a practical clinical standpoint. In nearly every case in which the biopsy findings were positive the cytologic findings were also positive, while the number of positive cytologic diagnoses in the cases in which bronchoscopic biopsy findings were negative was more than twice as great. Cytologic examination of bronchial secretions has aided enormously in arriving at a positive preoperative diagnosis of carcinoma and has increased the rate of positive diagnoses in patients exhibiting negative bronchoscopic findings. It also has aided in the diagnosis of bronchogenic carcinoma in a small group of patients before there was any demonstrable roentgen evidence of bronchopulmonary disease.

The sponge biopsy technique was applied to 80 patients subjected to diagnostic bronchoscopy or esophagoscopy by Carter, Nesbit, and Piper.[62] It was useful in

58. Carlisle, J. C.; Leary, W. V., and McDonald, J. P.: Endobronchial Lipoma, Proc. Staff Meet., Mayo Clin. **26**:103 (March 14) 1951.

59. Straus, G. D., and Guckien, J. L.: Schwannoma of the Tracheobronchial Tree, Ann. Otol. Rhin. & Laryng. **60**:242 (March) 1951.

60. Farber, S. M.; McGrath, Jr., A. K.; Benioff, M. A., and Espen, L. W.: The Early Diagnosis of Frimary Lung Cancer by Cytologic Methods, Dis. Chest **20**:237 (Sept.) 1951.

61. Clerf, L. H.; Herbut, P. A., and Nealon, T. E., Jr.: Cytologic Studies and Prognostic Results in Bronchogenic Carcinoma, Ann. Otol. Rhin. & Laryng. **60**:840 (Sept.) 1951.

62. Carter, M. G.; Nesbit, R. R., and Piper, C. A.: Endoscopic Sponge Biopsy, J. Thoracic Surg. **22**:386 (Oct.) 1951.

the identification of pulmonary tumors, differential diagnosis of inflammation and tumor, and the delineation of esophageal cancer with extension into the trachea; in one case it was useful for the diagnosis of a gastric carcinoma with submucosal esophageal extension. In the technique a small segment of absorbable sponge (gelfoam® or onkosponge®) was securely fastened to the standard endoscopic sponge carrier and introduced through the bronchoscope into the orifice of the suspected lobe or segment. The sponge was moved gently, remaining in contact with the mucosal surface for one minute, and then withdrawn and placed immediately in the fixative solution (10% formalin). In the pathology laboratory the sponge was handled the same way as tissue sections. The following precautions should be observed to obtain satisfactory results: (1) The sponge must remain in contact with the secretions long enough to insure absorption of a large number of cells, the minimum time being one minute; (2) when the sponge is placed on the carrier care must be taken not to compress the sponge with the fingers and destroy its absorptive quality; (3) the sponge must be placed immediately in the fixing solution to prevent distortion of the cells by drying. The authors believe that this technique produces more readable preparations than the current endoscopic cytologic methods of diagnosis.

Jackson and co-workers,[63] in their study of the virtues of exfoliative cytology, admitted 270 patients to the hospital for diagnosis and treatment; 100 of them proved to have carcinoma. For 61% of these the diagnosis was made by positive smear. There were 18 cases in which the bronchoscopic studies were negative and the results of the cytologic study of the bronchial secretions was positive.

CARCINOMA IN SITU

Within recent years there has been a marked increase in the number of cases of carcinoma in situ reported from various portions of the body, due largely to the wider use of cytological methods of diagnosis. A case of carcinoma in situ of the right lower lobe bronchus is reported by Papanicolaou and Koprowska.[64] The only positive findings were carcinoma cells in the sputum and bronchial washings. On careful examination of the lungs no gross tumor was visible, but a minute area in the right lower lobe bronchus was roughened on palpation and on random sections taken from this region carcinoma in situ was detected.

CARINAL BIOPSY

Kramer and Rabin[65] suggest that bronchoscopic biopsy of the carinal region be routinely performed before surgical treatment for patients with carcinoma of the bronchus is decided on. Biopsy of the carinal region was found to give positive results in many cases of large branch bronchus carcinoma, indicating an inoperable pulmonary lesion because of lymphatic or submucosal invasion by carcinoma. The

63. Jackson, E.; Bertoli, F., and Ackerman, L. U.: Exfoliative Cytology, J. Thoracic Surg. **21**:7 (Jan.) 1951.

64. Papanicolaou, G. N., and Koprowska, I.: Carcinoma in Situ of the Right Lower Bronchus, Cancer **4**:141 (Jan.) 1951.

65. Kramer, R., and Rabin, C.: Carinal Biopsy, Ann. Otol. Rhin. & Laryng. **60**:847 (Sept.) 1951.

specimen of tissue was taken from three places: (1) the edge of the carina, by gently stripping off the mucosa; (2) the upper 1 to 2 cm. of the medial wall of the main bronchus, and (3) the lateral wall of the main bronchus at the level of the carina.

DYSPHAGIA

Samson and Dugan [66] describe by case reports three unusual causes of dysphagia: (1) benign leiomyoma of the esophagus; (2) chronic tuberculous lymphadenitis with localized abscess formation, and (3) dysphagia lusoria, due to an anomalous right subclavian artery. The authors describe a new esophagoscopic sign which they consider pathognomonic of anomalous right subclavian artery: When there is an anomalous right subclavian artery backward pressure on the pulsating area in the esophagus with the bevel of the esophagoscope completely eliminates the right radial pulse without affecting the left or either of the temporal or carotid pulses.

CONGENITAL ESOPHAGEAL ANOMALIES

Holinger and his associates [67] divide anomalies of the esophagus into three groups: (1) anomalies of the esophagus alone, (2) esophageal anomalies associated with tracheal defect, and (3) esophageal anomalies in association with or produced by anomalies of other structures. In the authors' cases congenital anomalies were suspected when there was a history of dysphagia, aspiration pneumonia, drooling, and "feeding problems" in infants. The diagnosis of atresia was made by fluoroscopy with iodized oil and films, but in case of other anomalies esophagoscopy was needed to assist in the diagnosis. Atresia was treated surgically. Because of the frequency with which stenoses can be corrected endoscopically and because of the problems associated with postsurgical strictures, surgery was performed in these cases only if adequate endoscopic trial failed. The management of esophageal strictures following surgery and pre- and post-operative pulmonary complications required special attention and treatment by the endoscopist.

Gans and Potts [68] reported a case of an anomalous lobe of the lung arising from the esophagus in a 5-month-old infant with cough, frequently associated with vomiting, as the outstanding symptom. On bronchoscopy the left upper and lower lobe bronchi were compressed, with little air exchange, and an aspirator could be advanced only a few millimeters into the upper lobe orifice. On esophagoscopy a fistula was located about the level of the tracheal bifurcation. The fistula appeared to be lined with normal mucous membrane, and with each respiration pus was expelled freely from the bronchus-like tract into the esophagus.

Bosher and Taylor [69] report a case of heterotopia not associated with thoracic stomach or short esophagus in which the lower half of the esophagus was completely lined with gastric mucosa. On esophagoscopy the junction of squamous and

66. Samson, P. C., and Dugan, D. J.: Unusual Causes of Dysphagia, Ann. Otol. Rhin. & Laryng. **60**:738 (Sept.) 1951.

67. Holinger, P. H.; Johnston, K. C., and Potts, W. J.: Congenital Anomalies of the Esophagus, Ann. Otol. Rhin. & Laryng. **60**:707 (Sept.) 1951.

68. Gans, S. L., and Potts, W. J.: Anomalous Lobe of Lung Arising from the Esophagus, J. Thoracic Surg. **21**:313 (March) 1951.

69. Bosher, L. H., Jr., and Taylor, F. H.: Heterotopic Gastric Mucosa in Esophagus with Ulceration and Stricture Formation, J. Thoracic Surg. **21**:306 (March) 1951.

gastric epithelium was located 23 cm. from the incisor teeth, with ulceration and stricture at this point. The stenosis admitted a 5 mm. esophagoscope and extended several centimeters along the esophagus. This anomalous condition was confirmed upon histologic examination of the surgically removed lower esophagus.

BRONCHOESOPHAGEAL FISTULA

Ferguson [70] reports five cases of infants with congenital tracheoesophageal fistula without an associated esophageal atresia. The symptomatology is not definite, but the diagnosis should be suspected when an infant has frequent attacks of choking, with or without cyanosis, during feedings. The diagnosis is often difficult, and the passage of a catheter through the esophagus does not eliminate the possibility of a tracheoesophageal fistula. Additional methods of diagnosis consist of iodized oil studies of the trachea and esophagus and endoscopic procedures with dyes or iodized oil under pressure. Repetition of these procedures is frequently needed to establish the diagnosis. In the five cases presented the diagnosis was made during the first year of life, and in three the fistula was closed by surgery before the end of the second month.

A case of bronchoesophageal fistula with broncholithiasis was reported by Kidd and Christopherson.[71] There are many signs and symptoms common to these two conditions, of which pyrexia, chills, cough, purulent sputum, pain, and hemoptysis may be cited. The diagnosis of broncholithiasis was established in this case by expectoration of calculi, but the fistula was not suspected.

ESOPHAGEAL PERFORATION

Slesser [72] reviews rupture of the esophagus due to spontaneous causes, foreign bodies, and instrumentation. In perforation of the thoracic esophagus the best prognosis follows early suture of the actual tear. In cases of perforation of the cervical esophagus and hypopharynx there is a place for conservative treatment, but if there is no response to this operation and drainage should be undertaken.

One of the dangers attendant upon instrumental examination of the esophagus is perforation in the cricopharyngeal region. Such a case was reported by Knox,[73] who recommended immediate suturing of any tear as soon as emphysema is noted in the neck.

A case of erosion of the esophagus by an intrathoracic goiter proved by esophagoscopy and biopsy is reported by Davidson and Turner.[74]

ESOPHAGITIS

The possibility of esophagitis or esophageal ulcer should be considered when the symptoms of substernal burning or epigastric pain occur during or shortly after

70. Ferguson, C. F.: Congenital Tracheoesophageal Fistula not Associated with Atresia of the Esophagus, Laryngoscope **61**:718 (Aug.) 1951.

71. Kidd, H. H., and Christopherson, E.: Broncholithiasis and Broncho-Esophageal Fistula, Canad. M. A. J. **64**:142 (Feb.) 1951.

72. Slesser, B. V.: Rupture of the Esophagus, Thorax **6**:389 (Dec.) 1951.

73. Knox, L.: Postcricoid Pharyngo-Esophageal Perforation Due to Endoscopy, South African M. J. **25**:37 (Jan. 20) 1951.

74. Davidson, M., and Turner, J. L.: Erosion of the Esophagus by an Intrathoracic Goiter, Ann. Otol. Rhin. & Laryng. **60**:631 (Sept.) 1951.

meals. Esophageal ulcers are rarely demonstrable on roentgen examinations, and esophagoscopy is required for a definite diagnosis. Coffey and Dravin [75] report a case in which an esophageal ulcer had perforated, forming an abscess, which became walled off from the mediastinum but later ruptured into the abdominal cavity.

ESOPHAGEAL FOREIGN BODIES

In studying 400 cases of esophageal foreign bodies, Boyd [76] found that vomiting was the most frequent presenting symptom, followed in order by dysphagia, choking, pain, drooling, and cyanosis. In 35 patients there were no symptoms. The usual location of lodgment was at the cricoid level on the posterior wall. Many patients had long periods of distress before the correct diagnosis was made, and three cases were cited in which the foreign body was present for two months, four years, and six years, respectively. Traction diverticula, stenosis, and perforation occurred as complications. Of the fatal cases, one was due to persistent vomiting for three months, with terminal bronchopneumonia caused by an unrecognized button in the esophagus. The second was due to a stickpin which perforated the pleura from the esophagus and traveled to the periphery of the lung. In the third case the patient died for no obvious reason a few days after tracheotomy and removal of a plastic jack.

An unusual case of esophageal obstruction resulting from the swallowing of a dry proprietary laxative (serutan®) with insufficient fluid intake is reported by Hinkel.[77]

With the development of newer surgical techniques for the treatment of congenital esophageal atresia, additional problems have arisen for the esophagologist. Ross and his associates [78] report an unusual complication following esophagodermatoesophagoplasty when a coin became lodged in the extrathoracic portion of the reconstructed esophagus, necessitating esophagoscopic removal. The esophagoscope was inserted through the mouth to the region of the cricopharyngeus. At this point the instrument was turned to the left and tilted upward into the newly reconstructed esophagus. It was then turned sharply forward and downward at the level of the clavicle, over which it was passed with some difficulty, down to the point of constriction, where the coin was grasped and carefully removed.

A series of 56 patients suffering from symptoms following the ingestion of fish was studied by Goldman.[79] In 40 of the patients a fishbone was found at esophagoscopy or operation. The diagnosis was made by roentgen examination in 30 of the proved cases. With the roentgen techniques used at the present time a high percentage of positive radiopacity of fishbones can be obtained, and a greater reliance on roentgen diagnosis of fishbones in the cervical esophagus seems warranted.

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75. Coffey, J. H., and Dravin, I.: Perforated Esophageal Ulcer, Am. J. Digest. Dis. **18**:285 (Sept.) 1951.

76. Boyd, G.: Esophageal Foreign Bodies, Canad. M. A. J. **64**:102 (Feb.) 1951.

77. Hinkel, C. L.: Obstruction of the Esophagus, J. A. M. A. **146**:1129 (July 21) 1951.

78. Ross, D. E.; Baxter, H., and McHugh, H. E.: Œsophago-Dermato-Œsophagoplasty for Congenital Œsophageal Atresia, Canad. M. A. J. **64**:128 (Feb.) 1951.

79. Goldman, J. L.: Fish Bones in the Esophagus, Ann. Otol. Rhin. & Laryng. **60**:957 (Dec.) 1951.

ESOPHAGEAL STRICTURES

Preliminary animal experimental studies by Rosenberg and associates [80] indicated that cortisone may inhibit fibroplasia sufficiently to prevent the severe esophageal stenosis ordinarily resulting from a localized experimental lye burn. A high incidence of suppurative complications, mostly intrathoracic, in the cortisone-treated series of animals accounted for the higher mortality rate in these animals.

Barr and Koch [81] considered Salzer's method of treatment of chemical burns of the esophagus admirable in slight burns, but in the severer and deeper burns they advocated an indwelling rubber tube. An indwelling tube was passed by the oral route and drawn back through one nasal cavity on the 10th or 12th day after the injury. This time was selected, first, because it was felt that the damaged mucosa was best left undisturbed during the first few days, and, second, because the earliest time at which a stricture develops is at the end of the second week. The caliber of the tube varied according to the age; a 7 to 8 mm. size was used in children aged 1 to 2 years and a 10 to 12 mm. tube for adults. The tube was changed regularly every 10th or 14th day, with a 24-hour interval between removal of the old tube and passage of the new. Alternate nasal cavities were used, and adequate doses of antibiotics were given during the entire time the tube remained in place. In order to prevent stricture the indwelling tube treatment was continued until the process of cicatricial contraction was complete—approximately four to five months. The lumen obtained was satisfactory, and the only complication encountered was the development of pressure necrosis in the hypopharynx, which rapidly disappeared.

Hanckel [82] reviewed 35 cases, including 4 detailed representative case reports, of lye burns of the esophagus. The Salzer method of early dilatation, which prevented stricture formation in recent lye burns, required the shortest period of hospitalization and produced the most satisfactory end-results. In those cases with well established strictures preliminary gastrostomy followed by retrograde dilatations was used. Improvement in the technic of esophagogastrostomy has made surgical treatment the procedure of choice when the patient does not respond to retrograde dilatations or when it is desired to shorten the length of treatment.

Tucker and Hawthorne [83] presented their observations on the diagnosis and treatment of 111 cases of nonmalignant esophageal strictures. The treatment used was peroral endoscopic dilatation, with local applications when ulceration was present and retrograde and peroral continuous string dilatation in gastrostomized patients. By these methods satisfactory results were obtained for the most part, but about 10% of the patients had recurrence of obstruction.

80. Rosenberg, N.; Kunderman, P. J.; Vroman, L., and Moolten, S. E.: Prevention of Experimental Lye Strictures of the Esophagus by Cortisone, A. M. A. Arch. Surg. **63**:147 (Aug.) 1951.

81. Barr, B., and Koch, H.: The Treatment of Chemical Burns of the Esophagus, Acta oto-laryng. **39**:445 (Dec.) 1951.

82. Hanckel, R. W.: Lye Burns of the Esophagus, Ann. Otol. Rhin. & Laryng. **60**:22 (March) 1951.

83. Tucker, G., and Hawthorne, H. R.: Follow-Up Observations on the Treatment of Benign Stenosis of the Esophagus, Ann. Otol. Rhin. & Laryng. **60**:731 (Sept.) 1951.

CARDIOESOPHAGEAL RELAXATION

Persistent vomiting in infancy may be caused by many conditions. A case of cardioesophageal relaxation producing vomiting is cited by Spohn and Campbell.[84] This condition should be considered in all infants who vomit persistently after birth, the diagnosis being made by roentgen observation with barium. The vomiting is usually effortless and does not occur when the child is held upright.

ACHALASIA

In reviewing the question of etiology of esophageal achalasia, Kay[85] particularly stresses the importance of the ganglion cells in Auerbach's plexus. He summarizes as follows:

> When there is degeneration, reduction, or absence of ganglion cells in Auerbach's plexus a preponderance of sympathetic control develops; muscular coordination is removed; and the circulatory fibres become contracted and hypertrophied to the degree of causing an esophageal obstruction with secondary esophageal dilatation.

Balloon-kymograph motility records obtained by Kramer and Ingelfinger[86] before and after intramuscular injection of methacholine (mecholyl) in 11 patients with cardiospasm revealed an abnormal motility and a hypersensitivity to methacholine of the lower one-third to two-thirds of the esophagus. A similar response to the drug did not occur in 18 patients without esophageal disease or in 12 patients with a variety of esophageal disorders. Since the hypersensitive esophageal response to methacholine appears characteristic of achalasia, its use as a diagnostic tool was suggested. These studies support the theory that achalasia is a neuromuscular disorder which involves the cardia and lower esophagus.

Olsen and co-workers[87] reported that 60.2% of 452 patients with cardiospasm received permanent relief of dysphagia for periods of 4 to 16 years following a single course (one to two dilatations) of hydrostatic dilatation of the hiatus. The percentage of satisfactory results was increased to 75% by a second course, but additional courses of treatment were of little avail. Successful dilatation over a previously swallowed thread was accomplished by accurate placement of the dilator in the cardia and severe forceful dilatation of the physiologic sphincter by an expanding dilator. About 20% of the patients were not benefited by dilatation of the hiatus, and in this group surgical management was advocated, although the surgical results at the Mayo Clinic have not been very favorable.

In the medical management of achalasia of the esophagus, Nickerson and Call[88] reported on the use of dibenamine® (N,N-dibenzyl-beta-chloroethylamine) an adrenergic (sympathetic) blocking agent. Administered by infusion, the average dose was 500 mg. dissolved in 500 cc. of 0.9% sodium chloride solution; relaxation of the

84. Spohn, P. H., and Campbell, C. G.: Persistent Vomiting Due to Cardio-Œsophageal Relaxation in Infancy, Canad. M. A. J. **64**:126 (Feb.) 1951.

85. Kay, E. B.: Observations as to the Etiology and Treatment of Achalasia of the Esophagus, J. Thoracic Surg. **22**:254 (Sept.) 1951.

86. Kramer, P., and Ingelfinger, F. J.: Esophageal Sensitivity to Mecholyl in Cardiospasm, Gastroenterology **19**:242 (Oct.) 1951.

87. Olsen, A. M.; Harrington, S. W.; Moersch, H. J., and Anderson, H. A.: The Treatment of Cardiospasm, J. Thoracic Surg. **22**:164 (Aug.) 1951.

88. Nickerson, M., and Call, L. S.: Treatment of Cardiospasm with Adrenergic Blockade, Am. J. Med. **1**:123 (July) 1951.

cardia was observed fluoroscopically in approximately one hour's time. This drug may be used to supplement hydrostatic dilatation, but further investigation must be carried out before a true and authoritative evaluation of its usefulness can be ascertained.

In a preliminary report on the oral use of procaine in the treatment of achalasia Balfour and Wharton [89] state that they treated six patients with satisfactory results. It was reasoned that anesthetization of the esophagus relaxed spasm in certain types of cardiospasm, although it was not known whether relief of symptoms in the severer cases could be maintained. Four cubic centimeters of 2% procaine hydrochloride in 3 oz. (84 cc.) of water with 1 drachm (4 gm.) of psyllium hyprophilic mucilloid with dextrose (metamucil®) was administered, with immediate relief of dysphagia lasting from one to three hours. Fluoroscopic examination after administration of the medicine revealed no barium retained in the esophagus. No untoward reactions occurred after the medication. In addition to treatment of the milder forms of achalasia, it was thought that this medication may facilitate the passage of a string for dilatation in severe cases and may increase the accuracy of roentgen and esophagoscopic diagnoses of cancer.

ESOPHAGEAL HIATAL HERNIA

Allison [90] studied 204 patients with hiatal hernia and attributed the syndrome of heartburn, gastric flatulence, and postural regurgitation to reflux esophagitis; the typical esophagoscopic findings are enumerated. In addition, the author applied metal clips to the hiatus so that the movement of these could be observed under the fluoroscope. A wide esophagoscope was employed, and a portion of the epithelium at the esophagogastric junction was grasped with forceps and brought into the lumen of the tube in the form of a tent. A special forceps carrying the clip was passed alongside the grasping forceps, and the clip was squeezed into place.

Four cases of massive hemorrhage from hiatus hernia are reported by Bowden and Miller.[91] Temporary incarceration of the herniated portion of the stomach, leading to vascular engorgement, with subsequent mucosal necrosis and ulceration is thought to be the cause of the massive hemorrhage.

An unusual report of a case of retrograde extrusion or prolapse of the gastric mucosa into the esophagus is submitted by Feldman.[92] Although the symptomatology was identical with that of hiatal hernia, fluoroscopic examination of the patients demonstrated that there was no change in the position of the esophagogastric junction but that the gastric mucosa in the region of the cardia, through its excessive redundancy, actually protruded or prolapsed into the esophagus.

89. Balfour, D. C., Jr., and Wharton, G. K.: Oral Procaine Hydrochloride for the Relief of Cardiospasm: Preliminary Report, Gastroenterology **18**:606 (Aug.) 1951.

90. Allison, P. R.: Reflux Esophagitis, Sliding Hiatal Hernia, and the Anatomy of Repair, Surg., Gynec. & Obst. **92**:419 (April) 1951.

91. Bowden, L., and Miller, C. J.: Massive Hematemesis from Hiatus Hernia, A. M. A. Arch. Surg. **63**:143 (Aug.) 1951.

92. Feldman, M.: Retrograde Extrusion or Prolapse of Gastric Mucosa into Esophagus, Am. J. M. Sc. **222**:54 (July) 1951.

BENIGN TUMORS OF ESOPHAGUS

When a benign tumor of the esophagus is small and produces few symptoms it may be left alone and watched; but, in view of the possible malignant change, especially in intramural leiomyoma, Korkis [93] recommends removal in every case. Endoscopic removal is the method of choice for pedunculated tumors arising from the upper end of the esophagus, provided the tumor is not too large. For large pedunculated tumors, benign intramural tumors, and benign tumors of the lower esophagus, external operation is advised.

McBride [94] reports a case of a large benign polyp of the esophagus in which an erroneous diagnosis of achalasia was made on the basis of roentgenography and esophagoscopy. Other cases in which the polyp was missed by esophagoscopy are cited. The explanation is probably that the esophagoscope descends along a lesion covered with normal membrane, and the examiner considers this to be redundant esophageal folds. In the case presented disparity between the size of the esophagus on roentgenography and the apparent size of the lumen on endoscopy might have furnished a lead.

ESOPHAGEAL VARICES

Palmer [95] measured the pressure within esophageal varices by means of a needle introduced through the esophagoscope and obtained information useful in the evaluation of the success of portal shunt operations. Measurements may be made with an injecting needle, such as is used in the sclerosing treatment of esophageal varices, plus a water manometer. Accuracy depends upon obtaining the readings at a time when the patient's thorax is at complete rest in partial expiration, and, secondly, the procedure must be done without exerting pressure on the proximal segment of the varix with the end of the esophagoscope, for this increases the pressure within the vein. In the illustrative case reports levels of from 110 to 135 mm. were considered normal readings.

Allison [96] describes another method of measuring blood pressure in esophageal varicosities. Under topical and intravenous anesthesia a large Negus esophagoscope is passed, and a short beveled needle, welded to the end of a Jackson bronchoscopic suction tube, is introduced into the varix. By means of a Hansen manometer pressures are measured from the top of the table on which the patient is lying. Certain modifications were made in the instruments used, and no untoward complications developed.

93. Korkis, F. B.: Benign Tumors of the Esophagus, J. Laryng. & Otol. **65**:638 (Sept.) 1951.

94. McBride, A. F., Jr.: Benign Polypoid Tumor of the Esophagus, Cancer **4**:708 (July) 1951.

95. Palmer, E. D.: Determination of Venous Pressure Within Esophageal Varices, J. A. M. A. **147**:570 (Oct. 6) 1951.

96. Allison, P.: The Measurement of Blood Pressure in Esophageal Veins, Thorax **6**:325 (Sept.) 1951.

Special Reports

HEARING AIDS ACCEPTED BY THE COUNCIL ON PHYSICAL MEDICINE AND REHABILITATION OF THE AMERICAN MEDICAL ASSOCIATION

AS OF SEPT. 1, 1952

Audicon Models 400 & 415
Mfr., National Earphone Co., Inc.
20 Shipman St.
Newark 2, N. J.

Audivox Model Super 67
Mfr., Audivox, Inc.—Successor to Western Electric Hearing Aid Division
123 Worcester St.
Boston 18

Aurex Models L & M
Mfr., Aurex Corporation
1117 N. Franklin St.
Chicago 10

Beltone Symphonette Model

Beltone Mono-Pac Model M
Mfr., Beltone Hearing Aid Co.
1450 W. 19th St.
Chicago 8

Cleartone Model 500

Cleartone Model 700

Cleartone Regency Model
Mfr., American Sound Products, Inc.
1303 S. Michigan Ave.
Chicago 5

Dahlberg Model D-1

Dahlberg Junior Model D-2
Mfr., The Dahlberg Company
2730 W. Lake St.
Minneapolis 16

Dysonic Model 1
Mfr., Dynamic Hearing Aids, Inc.
149 Church St.
New York 7

Electroear Model C
Mfr., American Earphone Co., Inc.
10 E. 43rd St.
New York 17

Gem Model V-35

Gem Model V-60
Mfr., The Gem Ear Phone Co., Inc.
50 W. 29th St.
New York 1

Maico UE Atomeer

Maico Quiet Ear Models G & H

Maico Model J
Mfr., The Maico Company, Inc.
21 N. 3rd St.
Minneapolis 1

Mears (Crystal & Magnetic) Aurophone Model 200

1947-Mears Aurophone Model 98
Mfr., Mears Radio Hearing Device Corporation
1 W. 34th St.
New York 1

Micronic Model 303

Micronic Model "Mercury"

Micronic Star Model
Mfr., Audivox, Inc.—Succesor to Western Electric Hearing Aid Division
123 Worcester St.
Boston 18

Microtone Audiomatic T-5

Microtone Classic Model T-9

Microtone Model T-10

Microtone Model T612

Microtone Model 45
Mfr., The Microtone Company
Ford Parkway on the Mississippi
St. Paul 1

National Cub Model (C)

National Model D (Duplex)

National Standard Model (T)

National Star Model (S)

National Ultrathin Model 504

National Vanity Model 506
Mfr., National Hearing Aid Laboratories
106 S. 7th St.
Philadelphia 6

Otarion Model E-4

Otarion Models F-1, F-2 & F-3

Otarion Models G-2 & G-3
Mfr., Otarion, Inc.
159 N. Dearborn St.
Chicago 1

Paravox Model D "Top-Twin-Tone"

Paravox Model J (Tiny-Myte)

Paravox Model XTS ('Xtra-Thin)

Paravox Model Y (YM, YC & YC-7) [Veri-Small]
Mfr., Paravox, Inc.
2056 E. 4th St.
Cleveland 15

Radioear Permo-Magnetic (Multipower)

Radioear Permo-Magnetic (Uniphone)

Radioear All-Magnetic Model 55

Radioear Model 62 Starlet

Radioear Model 72
Mfr., E. A. Myers & Sons, Inc.
306 Beverly Rd.
Mount Lebanon
Pittsburgh 16
Distr., Radioear Corporation

Rochester Model R-1

Rochester Model R-2
Mfr., Rochester Acoustical Laboratories, Inc.
117 Fourth St., S. W.
Rochester, Minn.

Silvertone Model J-92

Silvertone Model P-15
Mfr., Johnston Hearing Aid Mfg. Company
708 W. 40th St.
Minneapolis 8
Distr., Sears, Roebuck and Co.
925 S. Homan Ave.
Chicago 7

Solo-Pak Model 99
Mfr., Solo-Pak Electronics Corp.
Linden St.
Reading, Mass.

Sonotone Model 700

Sonotone Model 900

Sonotone Models 910 & 920

Sonotone Model 925

Sonotone Model 940

Sonotone Model 966
Mfr., Sonotone Corporation
Elmsford, N. Y.

Super-Fonic Hearing Aid
Mfr., American Sound Products, Inc.
1303 S. Michigan Ave.
Chicago 5

Televox Model E
Mfr., Televox Mfg. Company
1307 Sansom St.
Philadelphia 7

Telex Model 97

Telex Model 99

Telex Model 200

Telex Model 300-B

Telex Model 400

Telex Model 500

Telex Model 1700
Mfr., Telex, Inc.
Telex Park
St. Paul 1

Tonamic Model 50
Mfr., Tonamic, Inc.
12 Russell St.
Everett 49, Mass.

Tonemaster Model Royal

Tonemaster Cameo Model

Mfr., Tonemaster, Inc.
400 S. Washington St.
Peoria 2, Ill.

Unex Midget Model 95

Unex Midget Model 110

Unex Models 200 & 230

Mfr., Nichols & Clark
Hathorne, Mass.

Vacolite Models J & J-2

Mfr., Vacolite Company
3003 N. Henderson St.
Dallas 6, Texas

Western Electric Models 65 & 66

Mfr., Audivox, Inc.—Successor to Western Electric Hearing Aid Division
123 Worcester St.
Boston 18

Zenith Model 75

Zenith Miniature 75

Zenith Model Royal

Zenith Model Super-Royal

Mfr., Zenith Radio Corporation
5801 W. Dickens Ave.
Chicago 39

(All the accepted hearing devices have vacuum tubes.)

Accepted hearing aids more than five years old have been omitted from this list for brevity.

TABLE HEARING AIDS

Aurex Semi-Portable

Mfr., Aurex Corporation
1117 N. Franklin St.
Chicago 10

Precision Table Hearing Aid

Mfr., Precision Hearing Aids
5157 W. Grand Ave.
Chicago 39

Sonotone Professional Table Set Model 50

Mfr., Sonotone Corporation
Elmsford, N. Y.

Society Transactions

AMERICAN LARYNGOLOGICAL ASSOCIATION

Seventy-Third Annual Meeting, Toronto, Canada, May 23-24, 1952

H. Marshall Taylor, M.D., *President, Presiding*

Lewis H. Clerf, M.D., *Secretary*

Abstracted by Samuel Salinger, M.D.

I. Tuberculous Laryngitis: A Disappearing Clinical Entity. Dr. Ralph A. Fenton, Portland, Ore.

Dr. Fenton finds a marked reduction in the incidence of laryngeal involvement in pulmonary tuberculosis, evidenced by a comparison of recently released statistics with those of former years. He reports this incidence as being down to 4% and asserts that tuberculosis of the larynx is rarely seen except in institutions. He attributes the infrequency of the complication to the modern therapeutic measures, both medical and surgical, which have reduced the virulence of the organism and prevented its spread. Control of cough has had much to do with the prevention of secondary laryngological infection.

DISCUSSION

Dr. August L. Beck cautioned against classifying laryngeal tuberculosis as a late complication and cited an instance in his own family in which hoarseness and a hyperemic larynx led to a further examination and discovery of pulmonary tuberculosis.

Mr. R. Scott Stevenson (England) corroborated Dr. Fenton's thesis by reporting the statistics from one of the British sanitoria, in which the number of cases of laryngeal tuberculosis was reduced from 400 in 1940 to around 40 in a recent period. The infrequency of the complication was even noted by the Chairman of the Management Committee, who wrote to the speaker asking what justification there was for having a laryngologist in regular attendance. Nevertheless, he was impressed by the occasional occurrence of a case in which hoarseness was the first symptom leading to the diagnosis of tuberculosis.

Dr. Fenton, in closing, emphasized the point made by the discussers, namely, that hoarseness should be viewed with suspicion and that the possibility of tuberculosis in such cases should not be overlooked.

II. Branchiogenetic Carcinoma. Dr. Frederick T. Hill, Waterville, Me.

Dr. Hill discussed the difficulty of making a differential diagnosis in the case of a branchial cyst of the neck, particularly with reference to the late manifestation of malignant changes. Despite complete removal of the cyst, including the stalk, a recurrence was noted after 21 months and again 3 months later, at which time the growth was definitely malignant. Evidently, despite thorough surgical extirpation at the first operation, it was impossible to remove the last vestige of the stalk, which was lost in the peritonsillar muscular bed. Also there still remains a doubt as to the location of the primary focus.

DISCUSSION

Dr. I. J. Goodof (by invitation) discussed the histologic findings in this case and proved definitely that the original growth was a true branchial cyst, whereas the last section removed was a squamous-cell carcinoma with some lymphoid elements. This proves that malignancy can develop in any embryonic tissue and that only a careful search through serial sections will reveal this complication. It is not very likely in this case that the lesion was secondary to a primary carcinoma of the tonsil.

Dr. Bernard J. McMahon stated that he was convinced that the tumor was primarily a benign branchiogenic cyst which had progressed to a malignant tumor. It is possible that the cyst may have been malignant from the start, although there is no way of proving the fact. Nevertheless, the history and progress of the case would seem to indicate that the cyst was a primary lesion within the embryonic mass.

Dr. Henry B. Orton described a carcinoma of the thyroglossal duct, which would support the concept that embryonic tissue may be the site of primary carcinoma. He inquired whether Dr. Hill had transilluminated the mass. Embryologically, these cysts are due to a nerve, an artery, a membrane, and a muscle that do not penetrate into the tonsil itself, being blocked by a membrane which separates the cyst from the tonsil.

Dr. Francis L. Weille recalled a case similar to Dr. Hill's in which a small mass was removed from the digastric region and serial sections, while revealing a branchial cleft cyst of the papillary type, also showed areas of adenocarcinoma of aberrant thyroid tissue.

Dr. Howard W. D. McCort stated that, while most of these tumors are benign, one must always be on guard for the unsuspected area which may be malignant. He cited a case in which the malignancy had extended to the esophagus after an apparently successful removal of the original mass.

Dr. Hill, in closing, stated that the anaplasia was first noted at the time when the first recurrence was observed, which was 21 months after the primary operation. He was interested in Dr. Orton's report of a carcinoma of the thyroglossal duct, it being the first he had ever heard of. He certainly agreed with the speakers who emphasized the importance of serial sections.

III. The Suprahyoid Approach to Surgical Lesions at the Base of the Tongue. Dr. Charles D. Blassingame, Memphis.

The suprahyoid approach was quite popular at one time, as evidenced by the references cited by Dr. Blassingame. Earlier surgeons were impelled to employ it after viewing the excellent exposure afforded in the throats of would-be suicides. Later, however, the procedure fell into the discard. The author found this approach very advantageous in case of a tumor attached to the base of the tongue near the epiglottis, causing dysphagia and dyspnea. The technic of its removal via an incision through the thyrohyoid membrane afforded an excellent view of the tumor, which was easily removed. After the wound in the tongue was closed, the myelohyoid muscle was carefully sutured because of its importance in supporting the hyoid bone. Dr. Blassingame reported four cases in which operation was done by this method: two cases of carcinoma of the tongue, one case of lingual thyroid, and one case of hemangioma of the tongue.

DISCUSSION

Dr. Hugh G. Beatty stated that he had employed this procedure in selected cases for the past 20 years and expressed satisfaction with the results.

Dr. Rotenberg inquired as to the type of anesthesia employed in these cases and whether preoperative tracheotomy is always necessary.

Dr. Thomas C. Galloway recalled Dr. Norman Patterson's presentation of lateral pharyngotomy at a previous meeting, and the excellent results he reported. However, in this instance he would like to know why the suprahyoid approach is better than suspension laryngoscopy and surgical diathermy in tumors at the base of the tongue, cases in which the tumors are superficial and easily controlled. Those that are infiltrating, however, have a bad prognosis when treated surgically. In such cases the prognosis is better under irradiation therapy.

Dr. Henry B. Orton stated that there can be no question about the adequacy of the exposure in this approach, as has often been apparent in removing a larynx from above downward. It is probably a good procedure for dealing with benign tumors. However, carcinomas in this region are better exposed through a lateral pharnygotomy, which affords a view of the growth from behind.

Dr. Blassingame, in closing, replied to the query regarding preliminary tracheotomy, which he believes important both for unimpeded respiration and for delivery of the general anesthetic.

In the first case he reported it would have been impossible to remove the growth under suspension because of its size (6.5 cm. in diameter). He agreed with Dr. Orton regarding the proper approach for carcinomas of the base of the tongue.

IV. Rhinolith—Case Report. Dr. O. E. Van Alyea, M.D., and Dr. Carl D. Makart, M.D. (by invitation), Chicago.

The pathogenesis of rhinolith is similar to that of calculi in other areas. Practically always the concretion develops around a foreign body. In one of the two cases reported it was a piece of rubber band. Cases of purely endogenous origin are extremely rare, since in some of them it is possible that inhaled dust particles may have formed the nidus. Symptoms of unilateral nasal obstruction, bleeding, and a malodorous discharge over a long period should arouse suspicion of a rhinolith. Probing with a metal applicator will elicit a grating sensation as the metal contacts the calcareous mass. Most of these cases can be handled intranasally, although in some cases the mass has to be broken up before it can all be extracted. X-ray pictures usually reveal the opaque body in the nasal cavity proper at the level of the inferior turbinate or below.

DISCUSSION

Dr. John J. Shea commented on the frequency of these cases in children, who are notorious for pushing foreign bodies into the nose. He has seen a number of them among the gypsy children who play with beads. He had one case in a girl of 18 which was so large that it had eroded into the maxillary sinus and probably had its origin many years before. The nidus was a small shoe button.

Dr. Harris P. Mosher felt that the entire subject was, in the words of Conan Doyle, "purely elementary."

Dr. Van Alyea closed the discussion with the comment that although the subject may be elementary, the fact that he had seen two patients who had suffered for years with nasal symptoms due to an undiagnosed rhinolith would indicate that it might be worth while to direct attention to it, lest it be again overlooked.

V. The Use of Cortisone and Corticotropin (ACTH) in the Field of Otolaryngology. Dr. Henry L. Williams, M.D., and Dr. D. S. Bolstad, M.D. (by invitation), Rochester, Minn.

Dr. Williams called attention to the side-effects of cortisone therapy, which must be taken into consideration when one is contemplating its use. Cortisone affects various metabolic processes, causes sodium retention, retards the resistance mechanism against infection, slows down fibroblastic activity, and, at times, brings on psychic phenomena, such as euphoria or depression. In the nose and throat field there have been some reports of regression of polyps and amelioration of vasomotor symptoms, but these are as yet far from convincing. Good results have been noted in the treatment of lethal granuloma of the face. It appears that the type of pathology encountered in this malignant condition is susceptible to the inhibiting influence of cortisone, and long periods of quiescence have been observed during its use.

Dr. Bolstad stated that they had employed cortisone in 36 cases as a local spray in the nose. While some relief was observed in many of the cases, the symptoms returned to their previous state as soon as the drug was withdrawn. Since the same can be said of routine antiallergic therapy, there is no point in preferring cortisone, which offers no better outlook and, in addition, possesses certain harmful possibilities. The only point in its favor is the fact that when employed locally it has no influence on normal physiologic function and therefore is less dangerous than when given parenterally.

DISCUSSION

Dr. Thomas C. Galloway inquired as to why Dr. Williams termed a lesion "midline lethal granuloma," since the ones he had seen had not been in the midline. He mentioned one such case in which the lesion was treated by both radical surgery and electrocoagulation, followed by corticotropin and cortisone therapy, with almost complete healing. However, when the medication was stopped, the lesion began to spread again and is increasingly difficult to control. Nevertheless, the primary improvement was very impressive.

Dr. Samuel Salinger called attention to the beneficial results obtained in the treatment of penicillin reactions with cortisone. In two such cases the conditions cleared up within a few days, too short a time, certainly, for the development of any deleterious side-effects.

Dr. Francis L. Weille inquired whether Dr. Williams or the Mayo Clinic had reached any conclusions relative to the basic action of cortisone. At Harvard Medical School, Hastings has done some experiments with radioactive materials and has found that protein synthesis was reduced 50 to 60% in tissue cultures. He believes this to be the common factor in the action of these preparations.

Dr. Julius W. McCall used cortisone as a local injection in two cases of amyloidosis of the larynx, with but little evidence of improvement, although the voice in one case cleared up considerably.

Dr. R. Foster Marks reported a case of hyperplasia in the epipharynx and secretory otitis media in a child who had had her tonsils and adenoids removed and had been under antiallergic therapy. Since there was a marked reduction in hearing, a second tonsillectomy-adenoidectomy was performed, followed by cortisone therapy, 50 mg. a day for two months. The results were strikingly beneficial, the hearing returning to almost normal.

Dr. Harry P. Schenck mentioned compound D as being newer and considered more effective than compound E. He used some of it as a nasal spray and injected some into the turbinates in a few cases, but found it caused a great deal of irritation and accomplished no good. Even when used later in a water-soluble base the results were no better.

Corticotropin and cortisone were employed in one case of lethal granuloma without benefit. Intradermal testing with a filtrate obtained from some of the necrotic tissue removed failed to produce any reaction in six normal persons, although it did provoke a reaction when injected into the patient. Dr. Schenck feels that perhaps such studies carried on in a more thorough manner might throw some light on the pathogenesis of this condition.

Dr. Williams, in closing, commented on the fact that in the 14 cases of polyposis mentioned by Dr. Bolstad there was evidence of no greater degree of relief than is usually obtained with antihistaminics. Since the local use of cortisone is harmless, there is no objection to it except the expense.

As for Dr. Galloway's comments, it would appear that there is a question of differential diagnosis, since necrotic lesions due to microaerophilic anaerobes are not quite the same as the Krompecher type of epithelioma, which attacks the midline facial tissues. In Dr. Williams' cases, cultures were done for both aerobic and anaerobic organisms. The Krompecher lesion is attended by excess granulation formations which recede under the influence of cortisone, thus permitting biopsies which will reveal the true nature of the disease.

Dr. Williams expressed interest in Dr. Salinger's report, which is worth bearing in mind, considering the widespread use of penicillin and the severity of the occasional reaction.

Concerning the point of view of the Mayo Clinic as to the basic activity of cortisone, Dr. Williams was in no position to speak for the Clinic. However, it is his impression that the theory generally held relates to a form of local action on the cells, somewhat in the nature of a chemical stimulus to reaction.

He has had no experience with cortisone in amyloid disease, but has used cortisone in one case of secretory otitis media which failed to clear up, although a coexistent dermatitis did.

He used compound D in two cases but could see little difference in its action from that of compound E.

VI. Bronchography in Children. Dr. D. E. S. Wishart, Toronto, Canada.

Dr. Wishart described the newer procedures employed in the new Toronto Children's Hospital which have been more effective than the previous method reported in 1947. Bronchograms are obtained in children under general anesthesia with the multiplane fluoroscope, in a room that is ventilated and provided with a floor that is grounded. Only one lung is mapped at one sitting, the procedure being conducted jointly by the radiologist, the endoscopist, and the anesthetist, working as a team. The oil is got into the various lobes by appropriate postures of the patient, and spot films are taken after each lobe is filled. Sedatives are not given because the cough reflex is desirable in emptying the tract after the procedure. Thousands of bronchograms have

been taken without any ill effects on the patients, and as a result there have been 111 lobectomies and pneumonectomies performed successfully since 1945. The anesthetic employed is ethyl chloride for induction, followed by ether and oxygen.

DISCUSSION

Dr. Louis H. Clerf commented on the wealth of information that can be obtained in a properly equipped institution under the guidance of an interested team. He recalled the difficulties in the early days when bismuth powder was first used. As to instilling the oil through the bronchoscope, he finds no objection, although he personally has discarded the method.

Concerning the use of general anesthesia, he is in accord with Dr. Wishart and finds it safer than large doses of sedatives. The important thing is to diagnose bronchiectasis early, before the condition becomes inoperable.

Dr. Paul H. Holinger, having seen the set-up at Dr. Wishart's hospital, was very much impressed with the results of the teamwork developed. Although his own methods are not the same as Dr. Wishart's he feels that the results are as good. Dr. Wishart mentioned his objection to the use of the catheter in infants. Dr. Holinger does not find this an objection, having safely and successfully done it in the newborn by passing the catheter directly through the laryngeal spatula. As to the use of inhalation anesthesia, this is impossible in Chicago, where the building code forbids it anywhere that an x-ray apparatus is in use. Dr. Holinger uses sedatives and the catheter for instilling the oil.

Dr. Wishart, in closing, stated that he was happy to learn that others were obtaining good results through different procedures. We all learn from differences. He was interested in Dr. Holinger's statement that he used sedatives and the catheter in infants. He wished to know how Dr. Holinger overcomes the respiratory difficulty which frequently ensues when the infant's tongue is depressed. Having seen Dr. Holinger's set-up in Chicago, he was very much impressed and appreciated the information thus obtained.

VII. The Influence of Chemotherapeutic Drugs and Antibiotics on the Incidence and Course of Deep Neck Infections. Dr. August L. Beck, New Rochelle, N. Y.

Dr. Beck presented a comparative study of the incidence of deep neck infections in the pre-chemotherapy days, with a similar group observed since. He found a marked reduction in the percentage of infections following pharyngeal infections but an increase in the number due to dental and salivary foci. Reduction in the number of infections of visceral fascia may be attributed in part to better technics in the removal of foreign bodies from the esophagus. Bacteriologic studies in the two groups show a reduction of pure cultures of hemolytic streptococci since the advent of antibiotics. However, the masking effects of these drugs makes it more important to follow the clinical course very closely. Blood-stream infections have been much less often observed than in the preantibiotic days. Another observation has been the increase of other bacteria when the pyogenic organisms were suppressed by the antibiotics. Candida (Monilia) and other organisms are seen more frequently than formerly.

Tracheotomy is still a necessary procedure, especially in the presence of submaxillary infections.

DISCUSSION

Dr. Frederick T. Hill was pleased to note the emphasis placed on the masking effects of antibiotics, which often lead to delays that prove serious. As for the increase of complications following dental infections, he thought the comparative pathogenicity of the bacteria in these foci with those of the tonsil and pharynx may have been changed by the use of antibiotics.

Dr. Harris P. Mosher stated that the paper was most timely and appropriate.

Dr. James M. Robb stressed the importance of not delaying tracheotomy when the indications are in doubt. Such delay may at times prove costly.

Dr. Paul H. Holinger stressed the danger of giving antibiotics routinely after foreign body removal and then sending the patient home, only to have him return later with a neck infection. He does not favor the routine administration of antibiotics in these cases unless the trauma is significant or the temperature following the procedure is elevated.

Dr. Louis H. Clerf agreed with Dr. Holinger on this point. If antibiotics are to be given, there must be a good indication, in which case administration should be pushed to the limit. It is amazing how much can happen in 24 to 36 hours after use of an antibiotic has been discontinued. As for tracheotomy, there is no question of its importance in all doubtful cases. One can always decannulate a living patient, and certainly the scar is a negligible factor.

Dr. Francis W. Davison was interested in the type of antibiotic preferred by Dr. Beck. Considering the variable sensitivity of bacteria to different antibiotics, the correct choice would seem to be important. When giving penicillin, Dr. Davison uses large doses, averaging 5,000,000 units a day and more if the infection is especially virulent.

Dr. Beck, in closing, agreed that the desultory administration of an antibiotic without follow-up is a dangerous procedure. In all cases in which penicillin is considered for use it is important to ascertain whether the patient is allergic to it.

He was glad to note that Dr. Clerf agreed with him in the matter of doing a tracheotomy when in doubt.

Concerning the matter of dosage mentioned by Dr. Davison, it has been his practice in severe cases to give an aqueous penicillin preparation intravenously in addition to frequent intramuscular injections. When the condition is brought under control, he changes to the repository type, giving 400,000 units twice daily. In most cases he gives streptomycin for a few days, in addition to the penicillin.

While sensitivity tests are valuable, there frequently is not time enough to wait for the laboratory tests—therefore the early use of penicillin and streptomycin, which covers the great majority of cases.

VIII. Cartilage Homografts in Rhinoplasty: A Critical Evaluation. Dr. Samuel Salinger, Chicago.

Of all the materials employed at various times for restoring contour to the nose, human cartilage has proved by far the most dependable in the vast majority of cases. One of the chief drawbacks to its use, namely, its tendency to curl, is explained by Salinger as being due to differences in density between the cortical and medullary portions of the rib. He shows how this can be avoided by splitting the costal cartilage so as to balance the amount of cortical substance in the particular implant to be used. Salinger prefers a midcolumellar incision to the intranasal incision because it is easier to prepare the bed exactly in the midline and because there is less danger of infection. Examples of types of cases in which cartilage is suitable are shown; also specimens of cartilage removed after many years in situ.

DISCUSSION

Dr. James M. Robb stated that the material in this paper was worth presenting to residents in the hospitals once a month.

Dr. August L. Beck stated that he wholly approves the external incision described by Dr. Salinger and cannot understand why there still persists among many men a prejudice against it. There is no dirtier place in the body than the nostrils, and if it is possible to avoid that area when introducing an implant there is no reason why the fancied bugbear of an external scar should restrain one, since it has been his experience that when the procedure is properly done the resulting scar is practically negligible.

IX. Vacuum Frontal Sinusitis: Absorption of Air from the Frontal Sinus; Experimental Study on Dogs. Dr. Howard C. Ballenger, M.D., and Dr. John J. Ballenger, Winnetka, Ill.

The experiments by the younger Ballenger were performed on 15 dogs (21 frontal sinuses) for the purpose of determining what happens to air or gas trapped in the frontal sinus. The nasofrontal ducts were occluded by pressure of a pack introduced through a hole drilled in the bony wall without perforating the mucosal lining. Observations of air pressure in the sinus were made with a manometer through a second opening directly into the sinus cavity. The results in more than half the cases showed an average negative pressure of 20.67 mm. of

water after the initial rise had been passed over. The rate of absorption was not as rapid as that which occurs in the lungs after occlusion of the bronchus and is affected by factors such as temperature, thickness of the mucosa, and degree of vascularization. The results of the experiments would seem to prove that a negative pressure can develop in a sinus when the duct is blocked but that the rate is slower than anticipated and may be affected by the factors just mentioned.

DISCUSSION

DR. ARTHUR W. PROETZ was impressed with the character of the experiments. He appreciated the importance of changes in vasomotor pressure mentioned by the authors as having much to do with the results. Another factor in the same category is the fact that these animals, having been subjected to surgical procedures on the sinuses investigated, would be expected to show the normal incidental vascular reaction, which must necessarily influence the results. At any rate, when these reactions are applied to the human being it can readily be understood how a swelling of the blood vessels could contribute to a clinical headache, since the pressures within the sinus as observed by the Ballengers varied as much as 66 mm. of water in certain cases.

DR. BALLENGER, in closing, recalled some of his earliest experiments in which the insertion of a small silver cannula into the frontal sinus was followed by a hissing sound, which suggested the sudden entrance of air into a vacuum. It would be unreasonable not to assume that a vacuum can occur in the sinus, as it does in the other cavities of the body having communication with the outside.

X. Surgical Treatment of Chronic Frontal Sinusitis. DR. GUY L. BOYDEN, Portland, Ore.

Dr. Boyden reported that he has done the Sewell operation on 57 patients, with excellent results. The prime objective, namely, maintaining the patency of the duct, is accomplished by the mucosal flap described by Sewell, which covers the denuded bone about the opening, thus preventing the growth of granulations, which so often lead to occlusion. The ethmoid cells are removed in order to provide a wider egress from the frontal sinus. No packing is employed, but a rubber tube is left in place for a few days to maintain the mucosal flap.

DISCUSSION

DR. J. MCKENZIE BROWN, having seen some of Dr. Boyden's cases, can testify to the good results. However, he does the operation somewhat differently. The ethmoid cells are cleaned out according to the method described by Mosher some years ago. Then the frontal sinus is entered through Lyons' incision, which does not come down on the nose as far as the others. The sinus is opened sufficiently for complete inspection and adequate attention to the pathology found. The duct is enlarged with small curved Kerrison forceps, and a polyethylene tube is inserted, which is so shaped as not to slip down; the tube can be left in situ until the tract is epithelized.

DR. RALPH A. FENTON also attested to the results obtained by Dr. Boyden, whose technic is radical, following the teachings of Küstner and Sewell. However, he agrees with Dr. Brown that it is not always necessary to be so radical and that at times it is advisable to preserve the turbinates if at all possible.

DR. ROBERT C. MCNAUGHT, having been brought up in the same school as Dr. Boyden and having worked with Dr. Sewell, testified that Sewell was not as radical as was generally believed. He weighed his indications very carefully and consequently did not perform as large a number of these operations as might be supposed. Many of the patients come in from time to time and manifest a well-maintained patency. Dr. Sewell also did make a point of leaving the turbinates undisturbed. Dr. McNaught described a modified flap which was useful in a case in which a Lothrop-type operation was done for a bilateral sinusitis.

DR. BOYDEN, in closing, emphasized the point that tube drains are not needed when a healthy membrane is supplied for lining the duct. Also, he felt that removal of the entire lining was important and cited Dr. Mosher as having expressed himself similarly.

XI. Recurrent Laryngeal Nerve Paralysis: A Revised Conception Based on the Dissection of One Hundred Cadavers. Dr. Lewis F. Morrison, San Francisco.

Morrison studied the branching of the recurrent laryngeal nerve by careful dissection of 100 fresh cadavers and discovered considerable variation both in the number of branches and in the sites in the neck where these branches are given off. He found as many as six branches in a single instance. Comparison between the two sides showed 35% single trunk, 24% divided trunk, and 41% mixed. Division of the trunk was found in the suprathyroid area in 24%, the thyroid area in 54%, and the infrathyroid space in 20%. The variation in both number of branches and their location explains the various types of paresis seen after thyroid surgery. The illustrations are very helpful in clarifying the thesis.

DISCUSSION

Dr. Harris P. Mosher expressed his admiration of the manner in which the paper was given (extemporaneous) as well as the material presented. He considered it the ideal method of giving a medical paper.

Dr. James M. Robb inquired whether in a particular situation, such as multiple division of the nerve, it is not possible to have something less than a paralysis. He recalls one instance in which he wrote on a chart "Brownian movement of the vocal cord," expressing this thought.

Dr. Lewis H. Clerf felt that much of the confusion in the past was due to lack of such information as was supplied by Dr. Morrison in his investigation. He often wondered why the paralysis due to an aneurysm of the arch of the aorta causes a different type of paralysis from that which may follow thyroid surgery. A review of previous studies along these lines reveals less accurate findings than those discovered by Morrison. Bizarre types of paralysis are easier to explain now in the light of these newer findings. He has rarely seen a case of post-thyroidectomy paralysis with the cord in the intermediate position. The common position is one of adduction, either unilateral or bilateral. Recently he observed a case in which there was a bilateral paralysis, both cords being well tensed and only slightly abducted in a position between the midline and the intermediate. This would appear to be a very unusual type.

Dr. Morrison, in closing, answered Dr. Robb's query by stating that pareses do occur which can be explained on one of two assumptions: either the muscle is paralyzed only in part, the functioning portion accounting for the fibrillation occasionally observed, or the time factor may operate in cases in which recovery takes place after an initial paralysis.

Dr. Clerf's comments anent the confusion existing in the older literature might apply as well to some of the more recent textbooks.

The most interesting fact about the recurrent laryngeal nerve is that, despite dissections which were carried out in the past, it had not been discovered that such a large percentage divide extralaryngeally as shown by this investigation.

XII. The Place of Tracheotomy in Cranial Injuries. Dr. Howard W. D. McCart, Toronto, Canada.

Dr. McCart discussed the various cranial conditions causing symptoms which may necessitate a tracheotomy. Brain tissue is susceptible to anoxia, which may be relieved by the operation. The cough reflex may be retarded by medullary incapacity, leading to the accumulation of secretion; also paralysis of pharyngeal muscles may prevent expulsion of mucus; also anoxia may result from venous congestion due to intracranial pressure. He reported 11 cases, in 4 of which death occurred. Most of the patients who survived were undoubtedly helped by the tracheotomy which made it possible to keep the airway clear.

DISCUSSION

Dr. Thomas C. Galloway emphasized the obviousness of Dr. McCart's conclusions on a subject that only a few years ago was shrouded in confusion. It is a message that has yet not got across to the profession at large. The problem of anoxia is one of urgency: Eighty seconds of anoxia may result in permanent changes, 3 minutes is very serious, five minutes is likely to leave permanent brain changes, and eight minutes is likely to be fatal. These facts have

been proved in Corrillis' submersion experiments on dogs. These were substantiated by Motley, showing that death was not due to flooding the respiratory tract, which occurred only in the terminal stage.

In this connection, it is important to recognize that many men do not know how to do a tracheotomy. When a respirator is being used, Dr. Galloway insists on no undermining of the fascia. The only transverse incision he makes is across the thyroid fascia to free the isthmus. He agrees with Dr. McCart that one must not depend on an endotracheal tube for any length of time.

Dr. James M. Robb feels very strongly about the necessity for doing a tracheotomy before the situation becomes critical. Objections previously voiced in the days when intubation was the procedure of choice have no validity today, what with the help of suction, antibiotics, and the bronchoscope.

Dr. William J. McNally agreed that the prolonged use of an endothracheal tube may prove fatal, as he had occasion to observe in a recent case in which the tube was removed after 20 hours and tracheotomy postponed until it was too late.

Dr. McCart, in closing, reiterated Dr. Robb's point relative to the danger of delaying a tracheotomy. One cannot wait as in former days for the pulse to reach 150 or 160 before resorting to operation. As for the endotracheal tube, he does not like it, having seen several threatening granulomas as a result of its use. It certainly is simple enough to pass a bronchoscope, enabling one to do a leisurely and carefully executed tracheotomy.

Abstracts from Current Literature

Ear

Perforated Ear Drum Following Home Permanent Wave. Joseph Sataloff and John F. Wilson, J. A. M. A. **147**:1135 (Nov. 17) 1951.

The authors report this interesting case wherein a woman used a home permanent-wave solution and allowed some of the neutralizer to run into her left ear canal. This caused a sharp burning sensation, which ceased after water was applied. Aural fulness and loss of hearing resulted. Examination disclosed normal nose and throat structures, a clear nasopharynx, and normal tori and Eustachian tube openings. The right drum membrane was normal. The left drum membrane showed extensive anterior and inferior marginal perforation extending backward to the malleus. The audiogram showed a normal hearing acuity in the right ear and a conductive loss in the left ear. The latter has persisted for months, and, despite repeated efforts to stimulate closure, only slight healing of the perforation has taken place.

This condition was brought about by the erosive effect of the waving lotion, with resultant erosive perforation, and when the neutralizer was applied to the hair, some of the chemical entered the middle ear, causing the burning sensation.

There is a moderate discussion in the article of sensitivity produced by wave lotions and of conclusions of experimental work on the subject, but the authors stress that cases similar to this should be reported and that every effort should be made that exacting instructions be given for home use of wave sets to protect the eyes and ears from contact with all solutions and to postpone the waving process if any open cutaneous lesions or excoriations are present.

Gordon, Philadelphia.

Psychosomatic Aspects of Ménière's Disease. E. P. Fowler Jr. and A. Zeckel, J. A. M. A. **148**:1265 (April 12) 1952.

The question of the pathology of the disease, that has been shown to be due to labyrinthine hydrops, and other factors in this disease led the authors to study the effect of psychic stimuli to blood sludging. They have incorporated three illustrations in their article: one showing conjunctival vessels of a young man 4 hours before an attack of vertigo; another one showing narrowing of blood vessels and clumping of red blood cells 12 hours after an attack, and another showing clumped red blood cells slowing conjunctival circulation in a patient who had had an attack the night before.

The authors have conducted abundant studies and are convinced that Ménière's disease can be caused by psychogenic factors and that there is a slowing and arresting of the small blood vessel circulation within the labyrinth with blood sludging, the latter condition probably being the cause of the labyrinthine hydrops.

The only treatment for this type of condition is psychotherapy.

Gordon, Philadelphia.

Current Conceptions of Nonsuppurative Labyrinthitis. G. B. Trible, J. Internat. Coll. Surgeons **16**:759 (Dec.) 1951.

The author reviews extensively the various points of view concerning nonsuppurative labyrinthitis that are currently held by otologists all over the world. He describes some of the operative procedures that have been devised and their results.

The subject is vast and complex. Trible feels that a reconsideration and reclassification of the group of conditions classed as Ménière's symptom complex is desirable.

The question of allergy, histamines, and vitamins is well brought out, and the various destructive operations performed in England, Day's electrocoagulation of the labyrinth, Portmann's drainage of the sac, Dandy's total destruction of the cochlear and vestibular apparatus, Lempert's operation wherein both the round window and the oval window are opened to get rid of the tinnitus, and many more procedures are well documented.

Gordon, Philadelphia.

THE MENACING SPECTER OF CHRONIC AURAL SUPPURATION. FRANCIS L. LEDERER, J. Internat. Coll. Surgeons **17**:154 (Feb.) 1952.

Lederer discusses the clinical aspects of aural suppuration that confront the otologist. With so much antibiotic therapy, every one has found that there has been a marked decline in surgery.

The author points out, almost with ruthless logic and sound reasoning, that each patient should be accurately evaluated as far as the indications for surgery are concerned. He states: "It is true, and always has been true, that chronic suppurative otitis media in the majority of cases will respond to nonsurgical remedies." Directed therapy to the source of the otitic suppuration (in the nose, sinuses, nasopharynx, and pharynx) as well as the proper attention to the Eustachian tube and middle ear will resolve a good many cases. But in the case of those patients with chronic otorrhea especially from the attic, those with other types of disorders involving great acoustic loss or labyrinthine symptoms, and those with lateral sinus thrombophlebitis and intracranial extensions, the otologist should be alerted to restudy his case from the anatomic and pathological viewpoint. Cholesteatoma is another problem.

In the light of the extension of pathology, it is evident that antibiotic therapy alone cannot be relied upon. Otologic surgery using tested procedures is the correct approach. Each case should be evaluated along all of these lines and should be dealt with accordingly, and antimicrobial methods (parenteral and oral) alone should not be relied upon.

GORDON, Philadelphia.

SKIN GRAFTING IN RADICAL MASTOIDECTOMY AND FENESTRATION. FRED HARBERT, J. Internat. Coll. Surgeons **17**:213 (Feb.) 1952.

The author, who is now professor of otology in the Jefferson Medical College of Philadelphia, has had a great deal of experience in the preparation of skin grafts and their use. He describes in summary the mechanism of "take" and the methods of obtaining efficient grafts, some complications that may arise in the process, and the postoperative care of the grafts.

The original article is a short one but most informative, and everyone is advised to consult it for fuller comprehension.

GORDON, Philadelphia.

GROUP TESTING OF SCHOOL CHILDREN BY PURE TONE AUDIOMETRY. S. F. NIELSEN, J. Speech & Hearing Disorders **17**:4 (March) 1952.

A group audiometer capable of testing 19 pupils was used with school children in Denmark. Five frequencies from 256 to 4096 cps, in a group of four signals at the 45, 35, 25, 15, 5, and 0 db. intensities, could be tested. A total of 100 signals was delivered to each ear with the children making a dot on the paper when a short sound was heard and a long line when a long sound was heard. Test rechecks between 1943 and 1945 showed that hearing losses are commonest among younger pupils and that testing and follow-up treatment reduce the number and severity of hearing disorders in the upper grades.

PALMER, Wichita, Kan.

THE USE OF CANCELLOUS BONE GRAFTING AT TYMPANOMASTOIDECTOMY FOR PERMANENT EUSTACHIAN TUBE CLOSURE: A PRELIMINARY REPORT. LOUIS E. ADIN JR., Laryngoscope **42**:173 (Feb.) 1952.

Dryness of the ear following radical or modified radical temporal bone surgery is admittedly desirable. Failure may be due to patency of the Eustachian tube. Many methods have been proposed to obtain a dry ear, including curettage, application of various skin grafts, and use of muscle, cortical bone, cartilage, and other implants. None have proved entirely satisfactory. Because "like tissue" is most likely to "take" successfully, Adin employs cancellous bone grafts. Their open structure aids them in becoming attached to their host.

The tensor tympani muscle is removed, providing more access to the Eustachian tube. Cancellous bone (from a bone bank) is crushed into a paste and packed into the tube. Over this a skin graft is placed. The remainder of the cavity is also grafted (method described). Now, autogenous bone from the crest of the ilium is being used instead of banked bone. There should be even better results from this type of graft.

HITSCHLER, Philadelphia.

Pharynx

THE PROBLEM OF ADENOID SURGERY IN CHILDREN UNDER TWO. S. S. SAMUELS, Eye, Ear, Nose & Throat Month. **31**:85 (Feb.) 1952.

The question of the surgical removal of adenoids and tonsils, or of the adenoids alone, in very young children has been the subject of an infinite amount of discussion among physicians for many years. Samuels considers the adenoids to be much more important in the production of abnormal conditions than the tonsils. The adenoids are hidden from view and are therefore often overlooked. The tonsils, however, are plainly to be seen, and therefore pathologic processes in them are readily diagnosed.

If the adenoids are quite large, or the nasopharynx unusually small, so that the adenoids become relatively large, they may be the cause of obstruction to adjacent structures, owing to their natural position. In an epipharynx, small from the front backward, the adenoid easily obstructs the posterior nasal choanae, especially in the infant or very young child. The resultant obstruction to the respiratory channel is evidenced by mouth-breathing, continually running nose, snoring, and difficulty in feeding because the child is unable to swallow while the mouth is open to breathe. Obstruction takes place when relatively enlarged adenoid tissue blocks the orifices of one or both Eustachian tubes. In the very young child this is evidenced by the repeated occurrence of otitis media accompanying many, if not all, upper respiratory infections. Later in life this obstruction is manifested by the onset of so-called catarrhal deafness.

Besides the damage obstruction can possibly cause, the adenoids may cause difficulties of an infectious nature. They are subject to attack by many and varied pathogenic organisms. Acute upper respiratory infections may invade the adenoid tissue, and, while some feel that the adenoids are part of the immunologic resources of the body, they show little ability to rid themselves of infection and often become chronically diseased. In this state they contribute to the postnasal drip with its disturbing cough and the infection of the ears and adjacent sinuses. Also, the adenoids by their intrinsic infection may be the focus of a bacterial allergy.

Age is no contraindication to the removal of adenoids. Ether anesthesia, as light as practicable, is used routinely. On most children, except those under 6 to 9 months of age, a routine tonsillectomy is done, since this takes only a short time and may obviate the need for a later operation. The adenoids are then completely and painstakingly removed by means of an adenotome, curette, and punch, the latter under direct vision. Besides preventing regrowth of tissue, the complete and thorough operation will generally avoid postoperative hemorrhage. The latter in most cases occurs from tags of unseparated tissue and their remaining blood supply.

JENNES, Waterbury, Conn.

ELECTROCOAGULATION OF TONSILS. F. L. WAHRER, J. Internat. Coll. Surgeons **17**:224 (Feb.) 1952.

Wahrer has used electrocoagulation of the tonsils for the past 25 years and continued to use it. There are a few indications for this type of therapy, but it is not a good method for routine tonsillectomy.

A bipolar electrode, slightly curved and about 3/8 in. (1 cm.) long, is used, and the needles are inserted into the tissue slightly less than 1/4 in. (0.6 cm.). Only enough current is used to achieve the complete dehydration of the area of tonsil that is being coagulated, and three widely separated areas are chosen for coagulation at each sitting.

For anesthesia purposes 10% cocaine is applied topically, three applications at five-minute intervals. The tonsil tissue is watched. The instant there is blanching, the current is turned off. The current should never be left on until the tissues become white or begin to swell.

The removal of the average pair of tonsils takes from five to six treatments for each tonsil and is spread over a period of about 10 to 12 weeks. One tonsil is treated at one sitting, and the other tonsil is treated one week later.

GORDON, Philadelphia.

POLIOMYELITIS AND TONSILLECTOMIES. M. COHN, Rev. otorrinolaring. **11**:39 (Aug.) 1951.

Cohn evaluated all the pros and cons on this much disputed subject in a thorough review of the literature. A careful analysis of 560 cases of poliomyelitis in the Children's Hospital in Santiago, Chile, showed only one case in which poliomyelitis was preceded by a tonsillectomy.

He believes (1) that it has not been proved that tonsillectomies done in the summer months predispose to poliomyelitis; (2) that recent tonsillectomies in polio patients is an unimportant finding; (3) that of the total number of tonsillectomized children only a very insignificant number of patients develops poliomyelitis (when this occurs the bulbar form is more prevalent than others); (4) that a morbidity of poliomyelitis in Chile is below epidemic figures, and (5) that postponement of this type of operation in the summertime is not justified except when the morbidity of poliomyelitis reaches epidemic proportions in certain areas, and at that time all elective operations should be avoided.

PERSKY, Philadelphia.

CONSIDERATION OF A THOUSAND CASES OF TONSILLECTOMIES IN CHILDREN UNDER ETHYL CHLORIDE ANESTHESIA. MARIO RIUS, An. oto-rino-laring. Uruguay **21**:73, 1951.

Rius believes that ethyl chloride should be the anesthetic of choice for tonsillectomy and adenoidectomy in children. It is easy to use and pleasant for induction. It eliminates a considerable amount of psychic trauma. It does not depress respiration, its elimination is very rapid, and recuperation from the anesthetic follows quickly. Caution is necessary in supplemental use of barbiturates, since it is difficult to evaluate proper dosage, and they may cause laryngeal spasm, depress respiration, and have a variable reflex action depending on a psychic state of the patient. Rius further believes that intubation is unnecessary, since this is a very short operation, and that there are increased dangers with its use. Furthermore, recuperation is prolonged and very often accompanied by untoward complications when intubation is used.

PERSKY, Philadelphia.

Larynx

ANTIMICROBIAL THERAPY OF LARYNGEAL TUBERCULOSIS. L. J. WALLNER, Eye, Ear, Nose & Throat Month. **31**:25 (Jan.) 1952.

One of the latest additions to the list of otolaryngologic diseases apparently conquered by specific therapy is laryngeal tuberculosis. The disease of the larynx cannot be treated alone but must be considered as a complication in a patient already seriously ill with pulmonary tuberculosis. The treatment of the chest disease is always of primary importance. The antimicrobial therapy given for the laryngitis cannot of itself be expected to cure the chest disease. Resistant strains of organisms rapidly develop after the administration of streptomycin and render subsequent use of the drug ineffective. Inadequate dosage or use without considering the over-all picture may preclude the administration of streptomycin later when it may be more urgently needed, such as during or after a major surgical procedure.

The most important and widely used antimicrobial drug effective against tuberculosis is streptomycin. With large doses given over an extended period, in a high percentage of the patients evidence of toxic effects on the vestibular apparatus develops. With a dose of 0.5 gm. a day, toxic effects are practically eliminated and yet the drug remains therapeutically effective. Dihydrostreptomycin was introduced and said to be less neurotoxic when used in doses of 0.75 or 1 gm. a day, but lately it has been observed that while dihydrostreptomycin is less toxic on the vestibular apparatus, it has a tendency to produce tinnitus and deafness.

Paraaminosalicylic acid has an effective bacteriostatic action against the tubercle bacillus. The most effective schedule in tuberculosis is the so-called combined therapy. Streptomycin is given twice a week and paraaminosalicylic acid is given daily for 120 days or longer. The chief advantage of this schedule is that it delays the resistance of the organisms to streptomycin, allowing the drugs to be used effectively for long intervals.

The effects of drugs on tuberculous laryngitis may be evaluated by observing improvement in the subjective complaints of pain and hoarseness and in the objective appearance of the larynx. The criteria used in evaluating the latter must be clarified in reporting statistical results. From a prognostic standpoint it is most important that the progress of the disease be halted and enough regression occur so that the laryngeal lesion does not menace the patient's recovery from his pulmonary tuberculosis.

Wallner reports improvement in 80 to 90% of patients given streptomycin for tuberculosis of the larynx. Complete resolution of all gross pathologic changes so that the larynx appears entirely normal has been seen often following treatment with streptomycin. More commonly, the ulceration heals and there is subsidence of the edema and infiltration, but some thickening

and hyperemia remain. Prolonged subsequent observation proves the laryngeal disease quiescent. Possibly the term "inactive" or "quiescent" laryngeal tuberculosis is more correct in these cases. Objective improvement occurs more quickly with streptomycin alone than with paraaminosalicylic acid alone. It is of importance that paraaminosalicylic acid can be given with good effect to patients who are completely resistant to streptomycin. At present the consensus seems to be that the two drugs should be administered together so that resistance to streptomycin is delayed, allowing therapy over prolonged periods.

Wallner states that it is possible to cure or improve the laryngeal complications so that they are not an added handicap to the prospects of recovery. Antimicrobial therapy can be expected to remove the larynx from the picture and to allow cure of the chest by other means of therapy. The prognosis becomes that of the pulmonary condition alone, rather than the poorer one of pulmonary tuberculosis with laryngeal involvement.

JENNES, Waterbury, Conn.

HOARSENESS IN INFANTS AND CHILDREN. P. H. HOLINGER, K. C. JOHNSTON, and R. J. MCMAHON, Eye, Ear, Nose & Throat Month. **31**:247 (May) 1952.

Hoarseness in infants and children is a symptom requiring as careful and complete a study as in the adult. Neck and chest x-rays, a neurological examination, and, finally, a direct examination of the larynx of the infant are necessary to establish the diagnosis of hoarseness in the infant.

Among the various causes of hoarseness in the newborn child, both congenital anomalies and birth injuries must be considered as well as the stridulous crowing noise designated as congenital laryngeal stridor.

In children of preschool and school age the commonest cause of acute hoarseness is the acute laryngeal manifestations of respiratory tract infection. However, injuries may also result in acute hoarseness from local edema or hematoma. Chronic hoarseness may be caused by vocal abuse, chronic respiratory tract infection, or laryngeal papillomata. Careful examination of the entire patient, with chest x-rays, blood and urine examinations, and a thorough examination of the full length of both cords by mirror or direct laryngoscopy, is necessary to establish a diagnosis. In the chronic conditions voice correction therapy is of great value. In papilloma of the larynx endoscopic removal is the procedure of choice.

In the school-age child the problem of hoarseness, like the hearing problem, needs the complete understanding of both the parents and the teachers. Early recognition and careful management may avert permanent vocal cord damage.

JENNES, Waterbury, Conn.

DISLODGING FOREIGN BODIES, INSPIRED OR SWALLOWED BY CHILDREN, WITH AMINOPHYLLINE. I. N. KUGELMASS, J. A. M. A. **147**:1240 (Nov. 24) 1951.

Kugelmass reports six cases wherein rectal administration of 0.25 gm. (4 grains) of aminophylline in solution dislodged small smooth foreign bodies in the esophagus, larynx, and bronchus. It is remarkable to note how an effective cough dislodged the foreign body with immediate disappearance of symptoms.

GORDON, Philadelphia.

SMOKER'S LARYNX. EDITORIAL, J. A. M. A. **148**:1127 (March 29) 1952.

A series of 143 patients, ranging in age from 16 to 69 and including 129 men and 14 women, was observed. The entire group smoked from 20 to 120 cigarets a day.

The first lesion observed was a localized edema of part of a vocal cord, but later it was replaced by an edematous fibroma. Multiple tumor masses involving both cords will result from continual smoking at such a rate.

Hoarseness always results. If in 24 hours cessation of smoking does not cause a disappearance of the lesion, then surgical intervention may become necessary.

These findings should bring forcibly before the medical profession the fact that the advertised brands of cigarets are not irritation-free to the larynx, even though doctors, musical comedy stars, opera singers, and others have lent their names as testimonials to certain brands. Certain

it is that they are in no position to judge scientifically the effects of smoking in the body, and it is unlikely that they are aware of the published report of the laryngeal lesions as pointed out by the distinguished Dr. M. C. Myerson.

GORDON, Philadelphia.

DIAGNOSIS AND TREATMENT OF CANCER OF THE LARYNX: USE OF MEDIAN THYROTOMY, LARYNGECTOMY, IRRADIATION, AND IRRADIATION WITH SURGERY. GABRIEL TUCKER, J. A. M. A. **149**:119 (May 10) 1952.

Tucker reemphasizes the importance of early diagnosis with particular emphasis on the early symptoms of hoarseness and local discomfort. It is regarding the latter that this excellent article concerns itself. There are cancers that do not produce hoarseness, and often it is the lymph-node involvement that brings the patient to the physician. Tucker stresses again and again that "Local Discomfort also Needs to be Publicized as an Early Symptom . . . of Cancer."

Metastasis of cancer in the vocal area, where the lesion produces hoarseness, occurs late; metastasis of cancer in the silent area, not immediately concerned with voice production, occurs early. The vocal area consists of the true cords and the subglottic area, while the silent area takes in the ventricular bands, arytenoids, and epiglottis.

Tucker discusses the diagnosis and examination in detail and comments on the surgical procedures of median thryotomy and total laryngectomy, and the results obtained in surgical treatment and irradiation alone as well as irradiation with surgery.

For a fuller appreciation of this illuminating article, the reader is urged to see the original article.

GORDON, Philadelphia.

LARYNGECTOMY AND RADICAL NECK DISSECTION FOR CARCINOMA OF THE LARYNX. JOSEPH H. OGURA and JOSE A. BELLO, Laryngoscope **62**:1 (Jan.) 1952.

Block dissection of the neck is the method of choice for the treatment of all advanced laryngeal carcinomas. The described procedure combines laryngectomy and radical neck dissection in one stage, avoiding the cutting of the lymphatics necessary in two-stage operations. It is justified inasmuch as irradiation and other methods have been unsuccessful and also because there is little or no increase in the postoperative mortality as compared with that of laryngectomy alone. Also the cosmetic result, the voice, and other functions are as satisfactory as in laryngectomy alone.

HITSCHLER, Philadelphia.

CERVICAL METASTASIS: SURGICAL TREATMENT. WALTER P. WORK, Laryngoscope **62**:61 (Jan.) 1952.

Work reviews a series of 75 cases of laryngeal cancer in which the patients were treated surgically in a five-year period. The reasons for the choice of various types of surgical procedures used are given, and the results are evaluated. Methods of spread of the lesions are discussed. It is observed that with modern operative technique and supportive measures, extensive surgical procedures upon the larynx and neck are becoming safer and should be undertaken in cases of advanced carcinoma.

HITSCHLER, Philadelphia.

X-RAY THERAPY. L. H. GARLAND, Laryngoscope **62**:75 (Jan.) 1952.

There are many factors to be considered in the choice of treatment of laryngeal cancer. Age, extent of lesion, general health, and mental attitude of the patient all play a part. In treatment of early cord cancer, x-ray therapy has proved successful in many cases (Stages I and II, extrinsic 64% and intrinsic 80%). The results are better than those of surgery in terms of function. Garland's report is based on the cases of 130 patients with cancer treated by x-ray in the last 18 years.

HITSCHLER, Philadelphia.

ASPHYXIA BY TRACHEOBRONCHIAL SECRETIONS. N. ENDE and J. ZISKIND, Surg., Gynec. & Obst. **94**:57 (Jan.) 1952.

In a review of 137 consecutive autopsies Ende and Ziskind found six cases in which the cause of death seemed to be due directly to asphyxia from tracheobronchial secretions. Several experiments were conducted with catheters in the open trachea of cadavers. It was found that there

was considerable variation in the depth of insertion and adequacy of aspiration, but Ende and Ziskind still feel that sometimes catheter aspiration is the only procedure necessary, especially if it stimulates adequate coughing. It is recommended that bronchoscopy be performed without hesitation on patients with excess secretion who do not respond immediately to aspiration. Postural drainage is also recommended. [It is surprising that no mention is made of tracheotomy in connection with secretional obstruction.]

FRIEDBERG, Chicago.

BRONCHIOGENIC CARCINOMA. H. SALVESTRINI, A. LUCCHINI, and A. MARSANO, Rev. otorrinolaring. **11**:1 (April) 1951.

Salvestrini, Lucchini, and Marsano review 73 cases of bronchiogenic carcinoma that were reported to the thoracicosurgical department of the Catholic University Clinic Hospital. Diagnosis was confirmed in each case through biopsy, operation, or autopsy findings. Among the symptoms cough was the most frequent, and in a majority of the cases it was productive. Twenty per cent of the patients evidenced hemoptysis. Lesions in the periphery of the lungs were particularly difficult to diagnose, since local symptoms usually occur rather late, and the metastatic lesions may be the first symptoms noted. In 85% of the cases in this series the lesions seem to grow toward the bronchi, and it is in this group that early diagnosis is most important. Roentgenographic studies were somewhat disappointing. Positive diagnoses were effected in 16 cases, while indefinite and inconclusive diagnoses were reached in 57 cases. In 50 patients that were bronchoscoped, a positive diagnosis of bronchiogenic carcinoma was made in 24 of the instances. Cytologic study in 60 cases gave a true positive diagnosis in 51. Of the entire group 46 patients had inoperable conditions, 27 underwent thoracotomies, and 14 underwent resections. An analysis of the group having resections reveals that four patients died and 10 are still living. Of the latter group there are two patients that have had recurrences and two that are showing metastasis. On the other hand, there are three persons that have been alive more than two years, one more than one year, and two less than eight months.

In summarizing the results the authors state the belief that bronchoscopy is of extreme importance in diagnoses, even though in many cases diagnosis is difficult. Cytologic study is of great help, and x-ray examination should be carefully made and evaluated in conjunction with symptomatology and bronchoscopy. The only successful treatment is lung resection. Roentgen therapy has little value. Treatment with mustard gas has not shown any good results. Thoracotomy is advised in a number of cases, since it may be a more palliative measure and so permit a longer survival than in more extensive lung resections, particularly when the extension and involvement produce a hopeless prognosis.

PERSKY, Philadelphia.

TRACHEOLARYNGEAL GRANULOMA FOLLOWING ANESTHESIA BY INTUBATION. EDUARDO LOLI and MANUEL LOLI, Rev. peruana otorrhinolaring. y oftal. **11**:20 (July-Dec.) 1951.

Loli and Loli present the case of a patient who underwent a gastric resection for a duodenal ulcer. This operation was done with the patient under general intubation anesthesia and lasted for two hours. After the operation the patient became hoarse. Several months later an examination of the larynx revealed an extensive granuloma which involved both cords and extended to the first tracheal ring. The tissue was removed, and the histologic report revealed granulation tissue covered by stratified epithelium.

One of the dangers that may follow this type of anesthesia is that of sudden death caused by tracheolaryngeal obstruction as a direct result of a granuloma.

PERSKY, Philadelphia.

Nose

EPISTAXIS. L. M. MORSE, Eye, Ear, Nose & Throat Month. **31**:150 (March) 1952.

Morse believes that if nasal bleeding cannot be controlled within one week by conventional methods, ligation of a major artery of the neck is indicated. These arteries commonly include the external carotid artery and the anterior ethmoidal artery, the choice depending on the source of bleeding, which, of course, must first be established. Ligation of a major artery of

the neck in intractable situations is not only a lifesaving measure but also a financial economy, and it reduces the mental and physical stress on the patient and physician. Three cases are reported in detail.

JENNES, Waterbury, Conn.

ANGIONEUROTIC EDEMA DUE TO FOREIGN BODY LONG PRESENT IN THE NOSE: REPORT OF A CASE. BUNIM PRUZANSKI, J. A. M. A. **147**:1235 (NOV. 24) 1951.

Pruzanski reports a case of angioneurotic edema due to a foreign body (a peanut) in the nose, which was present for some 17 years. This was found on routine examination after the patient was referred from the allergy clinic.

The whole peanut, still in its shell, gave no local symptoms. The patient was 21 years old and did not remember having placed the peanut in the nose. The assumption that the peanut remained in the nose some 17 years seemed to be corroborated by the anatomical changes in the floor of the nose and of the left inferior concha. When the nose was first examined, a grayish spot was found on the left nasal fossa floor, and palpation of this spot with a probe yielded the impression of a firm substance deeply imbedded therein. After several attempts to move the hard mass by means of a blunt hook, without anesthesia, the foreign body broke and was finally removed in three parts, the procedure causing almost no bleeding. Reconstruction of the parts produced a whole peanut, still in its shell, which measured 12 mm. in length and 7 mm. in diameter. The shell was relatively thick and hard, and the kernel appeared to be a uniformly changed mass, soft, of cheese-like consistency, and strongly fetid. After its removal, a deep corresponding hollow in the floor of the nose was evident. Months later the hollow was no longer present but was filled up with normal mucosa. The peanut remained undecayed all those years, and the removal of it resulted in full recovery from the angioneurotic edema and recurrent colds.

GORDON, Philadelphia.

SEVERE NOSEBLEED AND ITS TREATMENT. O. E. HALLBERG, J. A. M. A. **148**:355 (Feb. 2) 1952.

Hallberg reports an analysis of 212 cases of epistaxis in patients who had been treated in the hospital by physicians of the Mayo Clinic from 1930 through 1950. He discusses the anatomy and tabulates the causative factors, the age distribution, the source of bleeding, and the treatment.

Hallberg concludes that the epistaxis in about 10% of these cases was due to trauma, that more than 50% of the patients were 55 years of age or older; that treatment consisted of conservative measures, packing, and electrocoagulation, and that ligation of the external carotid artery together with supportive measures was needed in but few cases. He details the technique of postnasal packing and of external carotid artery ligation.

GORDON, Philadelphia.

RHINOSCLEROMA SUCCESSFULLY TREATED WITH STREPTOMYCIN. D. A. RUSSELL, J. M. MOORE, and L. H. MATTMAN, J. A. M. A. **148**:642 (Feb. 23) 1952.

Russell, Moore, and Mattman discuss a case of rhinoscleroma treated with streptomycin in which clinical improvement was noted within five days after the beginning of therapy and cultures promptly became negative for Klebsiella rhinoscleromatis. Lesions did not recur during a subsequent three-year period of observation. This dramatic response to streptomycin therapy in this patient and in those mentioned elsewhere lends additional weight to other existing evidence that K. rhinoscleromatis is the causative agent in the disease from which it is named.

GORDON, Philadelphia.

PRESSURE TREATMENT OF MAXILLARY SINUSITIS. J. M. ROBINSON, J. A. M. A. **149**:436 (May 31) 1952.

Robinson has had the experience during the past several years of treating certain types of maxillary sinusitis in selected patients by applying local pressure to the mucosa of one or both of the maxillary sinuses. This is done by inserting a balloon through a small intranasal antrostomy made under the inferior turbinate and inflated with iodized oil. The oil does not contact the sinal mucosa and is not used for its medicinal value. It is used because it is heavier

than the sinal secretion, and as it distends the balloon it displaces the sinal secretion and exerts slight pressure on the sinal mucosa. This procedure is contraindicated during any acute inflammatory condition or allergic state, especially during an uncontrolled attack of bronchial asthma. It is of value during the subacute and chronic purulent state.

The pressure treatment to the maxillary sinuses and bronchoscopic drainage of the bronchiectasis areas in the lungs have helped many patients. When the application of pressure to the maxillary sinuses is better understood, it may replace the radical maxillary sinus operation except when there are irreversible structural or pathological changes in the maxillary sinuses.

GORDON, Philadelphia.

DISEASES OF THE NOSE AND NASAL ACCESSORY SINUSES IN RELATION TO THE EYE. L. SAVITT, J. Internat. Coll. Surgeons **17**:227 (Feb.) 1952.

Savitt discusses the extraocular and intraocular manifestations of the maxillary, frontal, and ethmoid sinuses and summarizes his findings as follows: 1. The anatomy of the nose and paranasal sinuses readily demonstrates their close relationship to the orbit. 2. It has been proved that there is a causal relation between conjunctival and nasal infections. 3. Hyperemia and edema of the lids are often demonstrated in association with infections of the paranasal sinuses. 4. Orbital abscess in the young person is a common complication of sinusitis. 5. Corneal ulcers may suggest chronic infection of the antrum. 6. Central scotomas when secondary to sphenoid or ethmoid infection are unilateral and usually appear first in the morning. 7. The etiologic factors causing retrograde optic neuritis have not been definitely established.

It is evident that the data presented in the author's study that there is a great need for a closer relation between the ophthalmologist and the rhinologist in their study of this important problem.

GORDON, Philadelphia.

TUMORS OF THE MAXILLARY ANTRUM. DELMAR F. WEAVER, Laryngoscope **62**:139 (Feb.) 1952.

All varieties of tumors of the maxillary sinus are reviewed briefly with many references to the literature. Diagnosis and treatment are considered, and a case of epithelioma is included in the study.

HITSCHLER, Philadelphia.

Miscellaneous

DIAGNOSIS OF MIGRAINE IN CHILDHOOD. E. SCHIFF, Deutsche med. Wchnschr. **76**:1003 (Aug. 17) 1951.

Attention is called to the abdominal migraine of children, in which nausea, vomiting, and abdominal pain are often the prominent symptoms. The author gives the history of a boy who was 12 years old when first seen and who was observed for about seven years. During this time he had a number of attacks, characterized by vertigo, severe headaches, and vomiting. Only once did he complain of severe abdominal pain, when the headache was slight. The attacks lasted one to two days. Between attacks no abnormalities were demonstrable. During the attack, bradycardia upon lying down was a prominent feature. Upon rising the frequency of the pulse increased. Upon electrocardiographic examination a sinus bradycardia was found in the patient and also in the father, who also had suffered since childhood with migraine. The hereditary factor is stressed.

AMBERG, Rochester, Minn. [A. M. A. AM. J. DIS. CHILD.].

CLINICAL FEATURES AND DIAGNOSIS OF INFECTIOUS MONONUCLEOSIS. V. KREDBA and J. ONDRACEK, Pediat. listy **6**:137, 1951.

On the basis of their observations on 143 children with infectious mononucleosis (during 3¼ years), the authors describe the clinical picture of the disease. The disease can take an acute course, with changes in the throat, swelling of the lymph nodes, and enlargement of the spleen and the liver. The spleen and the liver are enlarged only in some cases. In the subacute form of the disease the onset is insidious. First, one can observe enlargement of the lymph

nodes of the neck, and periglandular edema develops; then the spleen and the liver enlarge, and only then does the patient complain of sore throat, while a follicular or necrotic angina develops. The disease can be distinguished from diphtheria by the signs in the throat, although the enlargement of the lymph nodes is threatening, as in the malignant form of diphtheria. Enlargement of the spleen and liver, as well as of more groups of lymph nodes, is the rule. Seldom does mononucleosis take a chronic course. The patient complains for months of weakness and pain in the limbs, has an increased temperature in the afternoon, and exhibits hepatosplenomegaly.

For diagnosis, the most important factor is the blood picture, with a leucocyte count of 10,000 to 20,000 and an increase in the number of mononuclear cells of from 70 to 90%. There are an increase in the number of normal lymphocytes, large lymphocytes, monocytes, and plasma cells and an increase in the lymphoid monocytes typical of mononucleosis. The proportion of these monocytes reaches 5 to 30% of the white cells.

The prognosis is good. There is danger of rupture of the spleen or paralysis of the breathing center. The acute form subsides within a few days; the subacute form, in two to three weeks. Penicillin has a beneficial effect; the sore throat disappears within two to four days, and the temperature falls.

GRULEE, Evanston, Ill. [A. M. A. AM. J. DIS. CHILD.].

FAMILIAL HEMORRHAGIC DIATHESIS WITH PROLONGED BLEEDING TIME (PSEUDOHEMOPHILIA, THROMBOPATHIES). OLGA IMERSLUND, Acta pædiat. **38**:311, 1949.

The author has studied clinical manifestations and hereditary conditions in 22 patients who had chronic hemorrhagic diathesis with the same features as those described by von Willebrand: prolonged bleeding time, usually a normal number of thrombocytes, and normal coagulation time. The author has found nothing to show that the tendency to bleed is due to so-called thrombopathy. The results of the investigation of hereditary conditions suggest the existence of at least two hereditary types, one with a recessive factor and the other with a dominant factor.

FROM THE AUTHOR'S SUMMARY [A. M. A. AM. J. DIS. CHILD.].

News and Comment

AMERICAN OTOLOGICAL SOCIETY, INC.

At the annual meeting of the American Otological Society, Inc., on May 19, 1952, Dr. Albert C. Furstenberg was elected president for the year 1952-1953.

The next annual meeting of the American Otological Society, Inc., will be held in New Orleans, May 1 and 2, 1953, at the Roosevelt Hotel.

Directory of Otolaryngological Societies *

INTERNATIONAL

Pan American Association of Oto-Rhino-Laryngology and Broncho-Esophagology

Meeting: Fourth Pan-American Congress of Oto-Rhino-Laryngology and Broncho-Esophagology.
Place: México, D. F., Mexico, Time: January, 1954.
President: Dr. Justo Alonso.
Exec. Secretary: Dr. Chevalier Jackson, 1901 Walnut St., Philadelphia 3, Pa.
President of Congress: Dr. Ricardo Tapia Acuna.

Third Latin-American Congress of Otorhinolaryngology and Bronchoesophagology

Place: Caracas, Venezuela. Time: 1953.

Fifth International Congress of Oto-Rhino-Laryngology

Place: Amsterdam, Netherlands. Time: June 8-15, 1953.
President: Prof. Eelco Huizinga.
General Secretary: W. H. Struben, J. J. Viottastraat 1, Amsterdam-Z.
Scientific Secretaries: J. Bijtel and P. G. Gerlings.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Dean Lierle, Iowa City.
Secretary: Dr. Sam H. Sanders, 1089 Madison Ave., Memphis 3.
Place: San Francisco.

American Academy of Ophthalmology and Otolaryngology

President: Dr. Derrick Vail, 700 N. Michigan Avenue, Chicago 11.
Executive Secretary-Treasurer: Dr. William L. Benedict, 100-1st Ave. Bldg., Rochester, Minn.

American Board of Otolaryngology

Secretary: Dr. Dean M. Lierle, University Hospitals, Iowa City.
Place: Palmer House, Chicago. Time: Oct. 6-10, 1952.

American Broncho-Esophagological Association

President: Dr. Fred W. Dixon, 1027 Rose Bldg., Cleveland.
Secretary: Dr. Edwin N. Broyles, 1100 N. Charles St., Baltimore 1.
Place: Roosevelt Hotel, New Orleans. Time: April 28-29, 1953.

American Laryngological Association

President: Dr. H. Marshall Taylor, 111 W. Adams St., Jacksonville, Fla.
Secretary: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia 7.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester 7, N. Y.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester 7, N. Y.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.

SECTIONS:

Eastern.—Chairman: Dr. Francis W. Davison, Geisinger Memorial Hospital, Danville, Pa.
Place: Waldorf-Astoria, New York.
Southern.—Chairman: Dr. Lester A. Brown, 490 Peachtree St., Atlanta.
Place: Academy of Medicine, Atlanta.
Middle.—Chairman: Dr. Ralph J. McQuiston, 20 N. Meridian St., Indianapolis.
Place: Indianapolis Athletic Club, Indianapolis.
Western.—Chairman: Dr. Howard P. House, 1136 W. 6th St., Los Angeles.
Place: County Medical Building, Los Angeles.

AMERICAN OTOLOGICAL SOCIETY, INC.

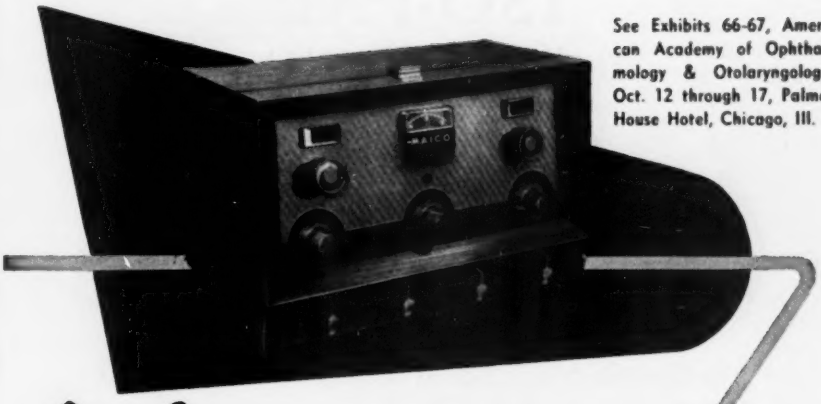
President: Dr. Albert C. Furstenberg, 201 S. Main St., Ann Arbor, Mich.
Secretary: Dr. John R. Lindsay, 950 E. 59th St., Chicago.
Place: Roosevelt Hotel, New Orleans. Time: May 1-2, 1953.

AMERICAN OTORHINOLOGIC SOCIETY FOR THE ADVANCEMENT OF PLASTIC AND RECONSTRUCTIVE SURGERY, INC.

President: Dr. Benjamin H. Shuster, 1824 Pine St., Philadelphia.
Secretary: Dr. Louis Joel Feit, 50 Park Ave., New York 16.

AMERICAN SOCIETY OF OPHTHALMOLOGIC AND OTOLARYNGOLOGIC ALLERGY

President: Dr. William H. Evans, 24 Wick Ave., Youngstown 3, Ohio.
Secretary-Treasurer: Dr. Joseph Hampsey, 806 May Bldg., Pittsburgh 22.



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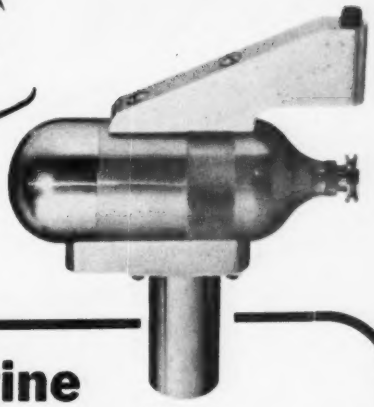

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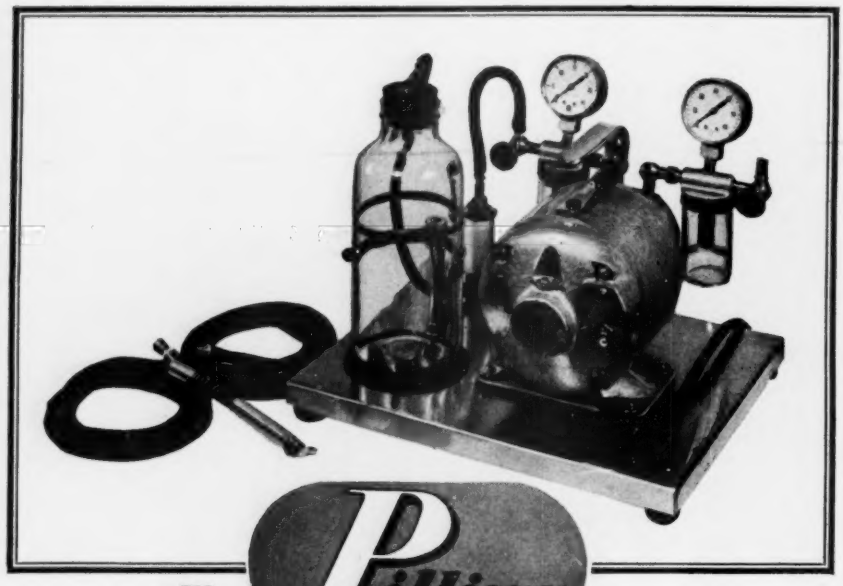

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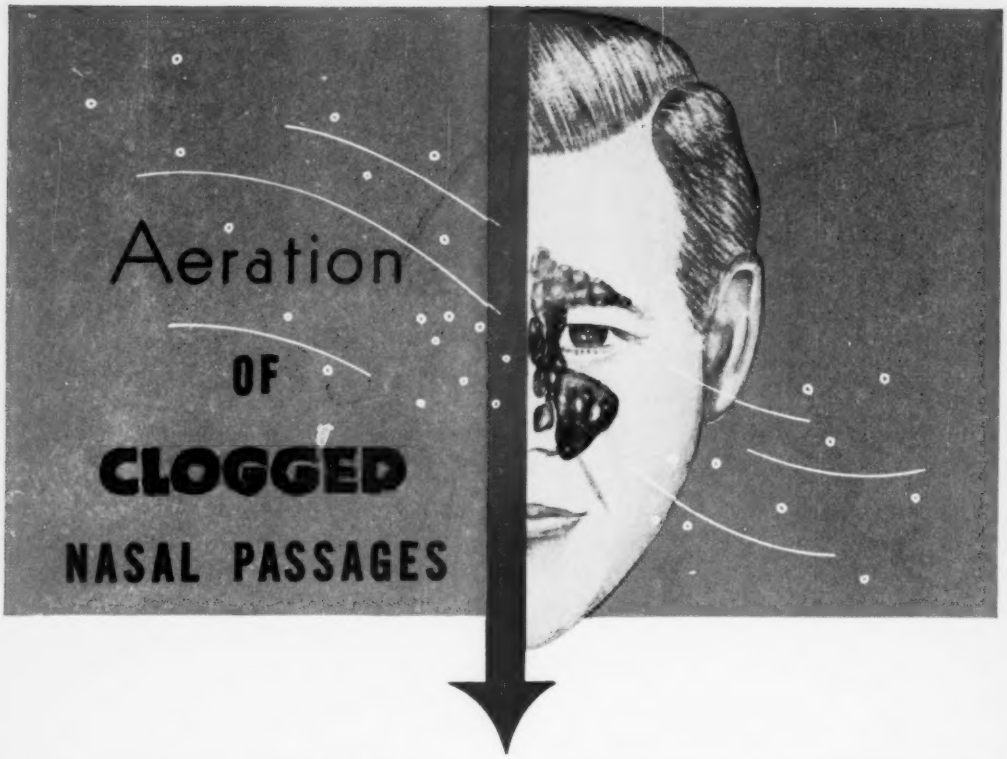

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1. Van Alyea, O. E., and Donnelly, Allen: *Arch. Otolaryng.*, 49:234, Feb., 1949.

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